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Sex differences in 6-month-old infants' affect and behavior : impact on maternal caregiving.

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SEX DIFFERENCES IN 6-MONTH-OLD INFANTS' AFFECT AND BEHAVIOR: IMPACT ON MATERNAL CAREGIVING

A Dissertation Presented

by

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ABSTRACT

SEX DIFFERENCES IN 6-MONTH-OLD INFANTS' AFFECT AND BEHAVIOR: IMPACT ON MATERNAL CAREGIVING

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Previous studies of gender differences in emotional and behavioral expressivity have generally found few differences between male and female infants despite persistent reports by parents to the contrary. This study presents striking sex differences in infants' behavior and affect during face-to-face interactions with their mother. 81 infants (43 females and 38 males) and their mothers were videotaped in Tronick's Still-Face Paradigm at 6 and 6 1/2 months. The Still-Face Paradigm consists of three two-minute episodes: normal age-appropriate interaction, mother acting unresponsive by holding a still-face (a stressful event), and a reunion of normal interaction. The infants' behavior (e.g., gaze, self-regulatory coping behaviors, gestural and vocal signals, and withdrawal/ escape behaviors) was coded using the Infant Regulatory Scoring System and their affective expressions with the AFFEX system. The mothers' behavior (e.g., facilitative

or disruptive behaviors, gaze, gestural and vocal signals) was coded with the Maternal Regulatory Scoring System and their affect with Emde's Maternal Hedonic Tone Scale. The videotapes were coded second by second and reliability was maintained at over 75% for each behavior and facial expression.

Boys showed significantly more joy and anger, more positive vocalizations, fussiness, and crying, more gestural signals directed towards the mother, and more escape behaviors than girls. Girls were significantly more likely to show interest, to gaze at objects, and to use self-regulatory behaviors such as diverting their attention to objects and to thumbsuck than boys. Several of these sex differences were stable over time and none could be accounted for in terms of maternal behavior and affect. Finally, significant between-session stability in both sexes' behavioral and affective displays was found particularly in the first play suggesting that stress does not highlight individual differences at this age.

These data indicate that boys are more affectively reactive and socially directed than girls, and that girls are more object oriented and use more self-regulatory behaviors than boys. Thus 6-month-old infants show gender based affective, behavioral, and self-regulatory differences that appear independent of maternal behavior and affect.

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CHAPTER 1

INTRODUCTION

This study focuses on sex differences in the affect and behavior of 81 6-month-old infants and on the impact these differences may have on maternal caregiving. The study addresses four questions: 1) Do male and female infants display different facial and behavioral expressions during Tronick's Still-Face Paradigm? 2) Do male and female infants react differently to normal face-to-face play, the still-face, and reunion face-to-face play? 3) Are there stable sex-related differences across a two week span in the infants' affect, behavior, and reactions to experimental contexts? and, 4) Are there sex-related differences in the types of affective and behavioral expressions mothers display to male and female infants? The literature review is focused on each question, and a list of hypotheses specific to the question are given at the end of each section.

Sex Differences in Infant Facial and Behavioral Expressions

In 1974, Maccoby and Jacklin concluded on the basis of an extensive literature review that few firm differences exist between boys and girls before the age of two.

Subsequent research, however, has made it increasingly clear that this conclusion may have been premature. Research on the newborn infant is beginning to suggest that there are sex differences in social responsiveness as well as in affect and state regulation within hours of delivery. Osofsky and O'Connell (1977), using the Neonatal Behavioral Assessment Scale (NBAS), found that female newborns are more responsive to both auditory and social stimuli. Other researchers found that although there is no difference in terms of frequency of eye contact, female neonates are capable of maintaining eye contact significantly longer than male newborns (Hittelman & Dickes, 1979). Brazelton, Koslowski, and Main (1974) have suggested that eye contact or the ability to orient to faces and voices function to indicate interest in social interaction and may be among the most rudimentary forms of nonverbal social signals. Thus the finding that female newborns are less likely than their male counterparts to break eye contact and avert their gaze, suggests that female and male newborns may be differentially responsive to social stimuli emitted by an interactive partner.

Male newborns also appear to experience greater difficulties in maintaining affect and state regulation. During both the administration of the NBAS and naturalistic observations, males smile less and display greater irritability, crying, facial grimacing, and

lability of emotional states (Feldman, Brody, & Miller, 1980; Korner, 1969; Osofsky & O'Connell, 1977; Phillips, King, & DuBois, 1978). Furthermore, they show a more rapid build-up of tension or a quicker peak of excitement than girls (Osofsky & O'Connell, 1977). Male newborns also sleep less, startle and kick more, and show greater tremulousness as well as more frequent motor movements than female neonates (Feldman et al., 1980; Korner, 1969, 1974; Phillips et al., 1978).

Taken together these findings suggest that male newborns are less able to regulate their physiological and emotional states. This regulatory limitation is corraborated by the finding that male newborns engage in less oral self-comforting, such as thumbsucking and mouth searching, which Brazelton and his colleagues (1974) believe serve to regulate periods of arousal, tension, excitement, or distress (Feldman et al., 1980; Korner, 1974). To the extent that this form of regulation is crucial to social and object engagement, then it is possible that self-regulatory limitations are at the base of some of the early male/female differences.

The evidence for sex differences in later infancy is controversial and hard to evaluate. Few studies specifically address this issue and it is likely that in cases where sex differences were not found these negative results were not reported. Among the studies which

evaluated sex differences, a number found no differences in older infants ranging in age from 3 to 9 months (Cohn & Tronick, 1987; Lewis, 1972; Tronick & Cohn, 1989). Other studies have found patterns of sex differences during later infancy which are similar to those reported during the newborn period. These studies indicate that older female infants retain their "advantage" in social responsiveness. For instance, Gunnar and Donahue (1980) found that female infants ranging in age from 6 to 12 months initiate more social interactions with their mothers and are more responsive to their mothers' vocalizations than male infants during a free play situation in the laboratory. Similarly, Klein and Durfee (1978) reported that 12-month-old girls show greater social competence in the home. Female infants are more likely to smile to, vocalize to, and share an object with the mother. They also seek contact and proximity with the mother more frequently than boys. Similar results have been reported by Goldberg and Lewis (1969) who found that 13-month-old girls were significantly more likely to touch and vocalize to their mother while playing in a laboratory setting.

Only a handful of studies have assessed sex differences in older infants' ability to regulate affect. Some of these studies show that boys continue to be more irritable and emotionally labile than girls. For instance, Moss (1967) found that both 3-week and 3-month-old male

infants sleep less, cry and fuss more, and are generally more irritable. In addition, a significantly larger number of boys are rated as having a difficult temperament by their parents at 4 months of age (Weissbluth & Liu, 1983). Other studies, however, report contradictory results. For example, Marcus and her colleagues (Marcus, Maccoby, Jacklin, & Doering, 1985) found no differences on the basis of maternal reports in the frequency of negative moods at 6, 9, 12, 18, and 24 months. Rather they found that mothers rate their male infants to be in a predominately happy/ excited mood and their girls to be in a predominately quiet/calm mood.

These findings are supported by a more rigorously conducted study which did not rely on parental perceptions (Haviland & Malatesta, 1981; Malatesta, 1982; Malatesta & Haviland, 1982). Malatesta and Haviland, using MAX coding of facial expressions, found no evidence that 3- and 6-month-old male infants cry more or are more irritable and emotionally labile than female infants. They reported that for boys, the most frequent facial expressions were knit brow and enjoyment, and that for females, the most frequent expressions were knit brow, enjoyment, interest, and anger. Although only the frequency of interest was significantly different for boys and girls, this research suggests that female infants may be more likely than male infants to display a greater variety of facial expressions.

The literature provides few explanations for the findings of sex differences in young male and female infants. Some authors have speculated that these findings reflect neurological and physiological differences. For instance, Feldman and his colleagues (1980) and Beach (1977) have speculated that male infants are neurologically more immature and physiologically more "vulnerable" than female infants. Others have hypothesized that these differences have a hormonal origin (Korner, 1974; Marcus et al., 1985). Marcus and her colleagues (1985), for example, found small, but significant, relations between mood during the first two years of life (as reported by the mother) and sex-steroid hormones assayed from umbilical cord blood at the time of the infants' birth. Whatever the causes may turn out to be, it is possible that underlying biological differences in boys and girls will exert an influence on the organization of the infant's behavior and affect as well as on the mother's responses to these displays.

Another perspective that is useful to consider when addressing the issue of sex differences during infancy is the Mutual Regulation Model (Gianino & Tronick, 1988; Sander, 1975, 1977; Tronick & Gianino, 1986; Tronick, 1989). According to this perspective infants must simultaneously regulate their internal physiological and emotional states and their engagements with the social and

inanimate worlds. In the young infant these four domains are inextricably linked and a disruption in one domain leads to disorganization in the other domains. For example, the infant who is unable to regulate body temperature will need to deploy available resources to control physiological processes. If the infant is unable to regain temperature homeostasis, he/she will in all likelihood become distressed and this dysregulated distressed state will preclude social and object engagement. Similarly, social and object stimulation frequently leads to gaze aversion and crying. Indeed stimulation of any kind can cause disruptions not only in social and object interactions but also in the infant's emotional and physiological states (Brazelton et al., 1974).

Infants have at their disposal two primary coping strategies to regulate physiological processes, affective states, and engagements with the social and object environments. The first type of strategy, the signaling strategy, involves behaviors and affective displays directed to a caregiver that function to modify the caregiver's behavior so as to facilitate the infant's needs. For instance, the infant can try to elicit a distracted mother's attention by displaying positive facial expressions and by using positive vocalizations. The infant can also protest by displaying facial expressions of

anger or sadness and by using fussy vocalizations or crying in an attempt to change the mother's behavior or to elicit the mother's help with for instance an object that is out of reach.

The second strategy, the disengagement strategy, involves decreasing infants' attention to distressing stimuli whether social or nonsocial. For example, infants can switch their attention away from the distressing stimulus and look at something else. Infants can also focus on themselves, that is self-comfort, and buffer themselves from stress. This is a form of self-gratification which includes behaviors such as thumb-sucking and rocking. In addition, they can use more extreme measures of disengagement. They can try to physically escape from the situation by turning, twisting, or arching their body, or they can push and pull away from the distressing stimulus. Finally, infants can inhibit their perceptual and attentional processes to such an extent that they look glazed and vacant or fall asleep.

These coping strategies are different from each other, primarily in terms of the infants' degree of disengagement from the social and inanimate environment. When infants signal to the mother, using for instance facial expressions and vocalizations, they remain socially engaged with the mother. When infants switch their attention away from the mother to an object, they give up the goal of maintaining

social engagement but sustain an engagement with the inanimate environment. Finally, when infants distance themselves from the stressor, or inhibit their perceptual and attentional processes, they sacrifice both social and object engagement in order to maintain internal regulation (See Table 1).

Table 1

Infant Coping Strategies

SIGNALING STRATEGIES	FACIAL EXPRESSIONS OF EMOTION
	VOCALIZATIONS
	GESTURES
DISENGAGEMENT STRATEGIES	ALTERNATE FOCUS
	SELF-COMFORTING
	PUSH/PULL AWAY
	ESCAPE/GET AWAY
	PERCEPTUAL WITHDRAWAL

Note: See Appendix A for a complete description of codes.

The Mutual regulation Model does not incorporate any specific assumptions about male/female differences in regulatory capacity. Nonetheless, given the gender differences found in the literature the model would predict that male infants will have greater difficulties engaging in social interactions and maintaining physiologic and

affective regulation. If interacting with objects or with a social partner provokes arousal and boys peak to excitement more readily than girls, then it may be expected that boys will become more negative and emotionally labile during social and object interactions. This hypothesis implies that boys may engage in more regulatory strategies (e.g., gaze aversion, self-comforting, and distancing) than girls in order to maintain equilibrium between emotional states and social and object interaction. It also implies that boys may be less able to maintain social, object, physiological, and emotional regulation, and therefore will engage objects less frequently than girls. This last hypothesis is based on the assumption that the incorporation of objects into social interactions requires more regulatory competence than the integration of physiological and emotional states with social interaction with no objects. That is, it is easier to regulate physiology, affect, and social interaction than it is to regulate physiology, affect, social, and object interaction.

Hypotheses

Based on the literature and on the Mutual Regulation Model, the following hypotheses will be tested in this study:

1. Six-month-old male infants will display more negative facial expressions, fuss and cry more, and show more distress than female infants during the Still-face Paradigm. Female infants will display more positive facial expressions particularly interest and more frequent positive/neutral vocalizations.

2. Male infants will be more emotionally labile than female infants. That is, the rate of change of facial expressions will be faster for boys than for girls.

3. Male infants will engage in more self-regulatory behaviors than girls. Specifically, they will display more gaze aversion, self-comforting, and distancing than female infants. Alternatively, males' greater emotional disorganization may reflect their inability to use self-regulatory strategies as effectively as girls. This implies that they may either display fewer self-regulatory strategies or more frequent but less effective strategies.

4. Male infants will engage objects less often than female infants. That is, female infants will display a larger number of behaviors and facial expressions directed toward people, objects, and the self whereas male infants' behavior and affect will be directed primarily towards the mother (e.g., looks at mother, signaling behaviors) and towards the self.

Sex Differences in Infants' Reactions to Experimental Contexts: Normal Face-To-Face Play, the Still-Face, and Reunion Face-To-Face Play.

Most of the studies examining sex differences during the first year of life have typically assessed the infant during normal face-to-face play interactions or during naturalistic home or nursery observations. Few researchers have assessed sex differences within a framework of different experimental contexts. Malatesta and Haviland (1982) separated 3- and 6-month-old infants from their mothers for 1 minute in order to ensure that a wide range of infant emotional expressions would be obtained. No attempt was made, however, to compare the data for the separation and subsequent 1 min reunion episodes presumably because there were no differences in the frequency of facial expressions. One reason for this may be that the separation episode was terminated after 10 seconds of fret crying by the infant. Another reason may be the authors' failure to assess the infants in an age-appropriate and sufficiently challenging situation. Sroufe and Waters (1977) have argued that an appropriate assessment of individual differences in infant competence must challenge or stress the infants' current developmental capacities and that when infants are confronted with an easy task they are more likely to appear typical than when they are exposed to

an age-appropriate stress. Several studies have demonstrated that infants do not find brief separations stressful until the age of 9 months (Field, 1977; Fogel, Diamond, Langhorst, & Demos, 1983). Thus if Sroufe's and Water's argument is extended to questions of sex differences then Malatesta and Haviland's use of a separation episode may have failed to highlight sex differences because the separation episode was not sufficiently challenging or stressful to the infants.

In the present study Tronick's (Tronick, Als, Adamson, Wise, & Brazelton, 1978) Still-Face Paradigm was chosen because it confronts the 6-month-old infant with an age-typical developmental task (face-to-face social interaction with the mother), and age-appropriate stress (the still-face episode), as well as a reunion episode during which the infant renegotiates the interaction after it has been stressed (reunion face-to-face social interaction). The still-face is stressful because it violates the infant's expectations concerning social interactions. The mother's en face position and eye contact signal the infant that social interaction is forthcoming while her expressionless face and lack of response communicate the opposite. The mother is saying "Hello" and "Good-bye" at the same time. Furthermore, the mother not only remains expressionless even after repeated attempts by the infant to reinstate interaction but she does not give the infant any regulatory

support. The manner in which the infant responds to this stress reflects his/her regulatory tendencies and coping strategies. Thus, the still-face taps the infant's ability to sustain interpersonal and object engagement while also maintaining self-regulation and may therefore be a particularly useful tool to uncover sex differences in the use of coping strategies.

The evidence from several studies examining sex differences in infant response to the still-face is mixed. Two studies have found no sex differences in infants' reactions to the still-face at 3, 6, and 9 months (Cohn & Tronick, 1987, 1989). Cohn and Tronick, however, used the Monadic Phases Scoring System which combines a priori facial and behavioral expressions. It is possible that a more discrete coding system is needed to unearth sex differences in infants' reactions to the still-face. Cohn and Tronick's findings are challenged by a couple of studies which have found sex differences in infants' reactions to the still-face. Mayes and Carter (1990) found that 3-month-old girls were more likely to evidence intense negative affect and to be more "disorganized" during the still-face than boys. Specifically, the female infants were more likely to cry, look away, arch their back, spit up, and to become inconsolable and out of control. These findings are consistent with Stoller's and Field's (1982) results indicating that 8- and 12-week-old girls show more

distress brow behavior and more crying than boys during the still-face. Mayes and Carter (1990) provide two possible explanations for these results. They suggest that mothers tend to respond more to the distress of girls than boys and that therefore distress behavior on the part of girls may be a particularly effective way for them to reinstate interaction. Alternatively, they suggest that mothers are more responsive to the affective bids and vocalizations of girls and that therefore the silence of the still-face may be more stressful to girls than to boys.

Weinberg and Tronick (1991b) have suggested that stress may highlight the stability and underlying organization of infants' coping strategies because it challenges the processes of internal and external regulation. This implies that the still-face episode may be particularly likely to pick up differences in boys' and girls' abilities to sustain interpersonal and object engagement while maintaining self-regulation. Another feature of the Still-Face Paradigm, however, the reunion episode, may also be useful for bringing out differences in the affect and behavior of boys and girls. This episode, like the still-face, challenges the infant's regulatory capacities. Additionally, because it follows the still-face, the infant is faced with regulating the carryover of negative affect from the still-face while attempting to

re-engage the mother in face-to-face play. A couple of studies suggest that reunion episodes may be particularly stressful and arousing for young infants. Weinberg and Tronick (1991a) found that 6-month-old infants were more likely to fuss and cry, to become emotionally labile, and to engage in self-comforting behaviors to modulate arousal during the reunion episode than during the still-face. Furthermore, in a second study, they found more stability between reunion interactions during the Still-Face Paradigm at 6 months and Ainsworth Strange Situation at 15 months than between normal play and still-face/separation conditions (Weinberg & Tronick, 1991b). The infants' negative affective and behavioral displays in particular were stable over time. These results confirm previous research demonstrating that there is a carry-over of negative affect from stressful episodes into reunion episodes (Cohn & Tronick, 1983). The data also suggest that it is the period following a stress that may most likely challenge the infants' ability to maintain internal and external regulation. Combining this with Sroufe's and Water's perspective, the period following the stress of the still-face may therefore be most likely to highlight sex differences in the organization of infant coping strategies.

Hypotheses

Based on the literature, the Mutual Regulation Model, and Sroufe's and Water's stress hypothesis as applied to sex differences, it is possible to hypothesize that:

1. Differences between males and females will be most pronounced during the reunion play episode, less evident during the still-face, and least likely to be found during the first normal play interaction; and that

2. Female infants will display more negative affective and behavioral reactions and more frequent self-regulatory behaviors during the still-face than males, whereas males, given their quicker peak to arousal and emotional lability, will display more negative affective and behavioral reactions and more frequent self-regulatory behaviors in response to the reunion play interaction than girls.

Stability of Sex Differences

Few studies have specifically looked at the stability of infant affective, behavioral, and self-regulatory displays in face-to-face interactions (Tronick & Weinberg, 1990; Weinberg & Tronick, 1991b). None of these studies looked at sex differences in the stability of infant expressions. In general, these studies suggest that

infants as young as 6 months of age are beginning to develop stable affective and behavioral patterns. Gianino and Tronick (1988), for instance, found that infants who exhibit a tendency to use particular signaling and disengagement strategies in the Still-face Paradigm are most likely to use similar strategies two weeks later when the procedure is repeated. Moreover, those infants who exhibit specific affective tendencies, such as smiling or crying, during the first visit tend to display a similar affective style at the second visit. Similarly, Tronick and Weinberg (1990), have found significant stability in facial expressions, gaze, self-comforting, gestural and vocal signals, and distancing behaviors between two administrations of the Still-Face Paradigm at 6 and 6 1/2 months.

Hypotheses

Based on this literature and on the data indicating that boys' affect and behavior may be less well organized than girls', it is hypothesized that:

1. Girls' affect and behavior, as compared to boys', will be more stable across a two week period.

Furthermore, in light of recent evidence that infants remember events that occurred many months earlier (Myers, Clifton, & Clarkson, 1987), it is expected that the 6-

month-old infants will remember the Still-Face Paradigm and that this recollection will have an impact on their affect and behavior during the readministration of the paradigm two weeks later. Thus if infants remember their experiences in a laboratory setting, and they find the still-face and reunion play episodes stressful, it is possible to hypothesize that:

2. The expectation or anticipation of stress during the second visit will serve to magnify the predicted sex differences. Thus, males will display more negative affect, behavior, and emotional lability, less effective self-regulatory strategies, and have greater difficulties regulating social and object engagement during the second visit than females. Furthermore, it is hypothesized that sex differences will be more pronounced in the infants' reactions to the episodes of the Still-Face Paradigm.

Sex-Related Differences in Maternal Affective and Behavioral Expressions

Although a few studies indicate that mothers act in the same way with male and female infants (Gunnar & Donahue, 1980; Carter, Mayes, & Pajer, 1990), most research suggests that mothers treat their male and female infants quite differently. Within the first 24 hours after birth, parents report different expectations about girls versus

boys. Rubin, Provenzano, and Luria (1974) found that parents describe their newborn daughters as small, soft, fine featured, inattentive, and cute. Males on the other hand were rated as firm, big, large featured, well coordinated, alert, and strong. Thus parents appear to organize their perceptions on the basis of gender alone for a wide variety of attributes ranging from attractiveness, activity, and even the infant's cognitive potential.

Infant gender does not only affect parental perceptions but also the way parents interact with their infants. Goldberg and Lewis (1969) have reported that mothers of 6-month-old infants are more likely to touch, talk to, and handle their daughters than their sons. These findings are partially consistent with the research of others. Both Lewis (1972) and Moss (1967), for instance, found that mothers of 3-week and 3-month-old infants vocalize more to their girls than to their boys. Lewis and Moss, however, also found that mothers hold and touch their male infants longer than their female infants possibly, as has been suggested by Moss, in an attempt to arouse their male infants to a higher activity level. Although there are inconsistencies, this research suggests that overall girls receive more distal stimulation, such as vocalizations, while boys receive more proximal stimulation, such as touching and holding (Lewis, 1972).

Goldberg's, Lewis', and Moss' research does not indicate that mothers of girls and boys differ in their amount of responsiveness. Rather the data suggest that mothers differ in the form of their responsiveness to male and female infants. Only one study has found sex-related differences in maternal responsiveness and involvement (Klein & Durfee, 1978). These authors reported that mothers are more responsive to and interact more with their female infants than with their male infants. Gunnar and Donahue (1980), however, noted that Klein and Durfee did not differentiate between maternal initiations of interaction and maternal responses to infant initiations. Thus Klein and Durfee's results may have been an artifact of girls attempting to interact more often with their mothers and the mothers being equally responsive to male and female bids for interaction.

Two studies have specifically examined maternal responsiveness and contingent behavior to infant affect and behavior (Tronick & Cohn, 1989; Malatesta & Haviland, 1982). These studies support the conclusion that mothers generally do not differ in their amount of responsiveness but rather in the nature of their involvement with boys and girls. Malatesta and Haviland (1982) found that mothers tend to match their 3- and 6-month-old sons' facial expressions and to respond with dissimilar facial expressions to their daughters' facial displays. They

also found that mothers display different facial expressions to the same facial expression of boys and girls. For example, they discovered that mothers are more likely to smile in response to males' smiles particularly with increasing age, and that when sons express anger mothers reciprocate with knitted-brow expressions. By contrast, mothers tend to match their daughters' expressions of anger with anger expressions of their own. Similarly, Tronick and Cohn (1989) found that mother-son dyads are more likely to change their behavior with respect to one another and to be in matching behavioral states. Social (e.g., mother and infant looking at each other at the same time) and object (e.g., mother and infant looking at the same object at the same time) matches were particularly likely.

Tronick and Cohn (1989) suggested that these results reflect different forms of attunement between mother-son and mother-daughter dyads. Malatesta and Haviland (Haviland & Malatesta, 1981; Malatesta, 1982; Malatesta & Haviland, 1982) further suggested that differential caretaking styles result from differences in the organization of behavior and affect in male and female infants. Specifically, they hypothesize that "mothers may be more cautious with male infants and more invested in keeping them contented, owing to male vulnerability and the fact that male infants tend to be more irritable and less

consolable" (Malatesta & Haviland, 1982, p.1001). If male infants are more irritable, emotionally labile, easily upset, and peak to excitement quicker than female infants, then it makes sense that mothers would use more contingent responding to males' positive affect, avoid negative affect which may be contagious or readily taken on by the infants (Izard, 1977; Tomkins, 1963), and limit the variability of their responses in order to promote optimal positivity in their male infants. Thus matching of male infant expressions may serve to keep the males' greater emotional instability under control. Correspondingly, mothers can engage in a greater variety of facial expressions and in more of a dialogue with their daughters' presumably because of female infants' greater emotional and behavioral organization. Thus mothers can display dissimilar affective displays to their daughters without running the risk of being reciprocated with irritability and crying.

Malatesta and Haviland's hypotheses are consistent with the perspective of the Mutual Regulation Model (Gianino & Tronick, 1988; Tronick & Gianino, 1986; Tronick, 1989). According to this model, every infant behavior, including facial expressions, serve a communicative function. These communications serve both to maintain a satisfying interchange and to terminate a social or object interaction that is not meeting the infant's needs. Thus, the infant who is smiling and cooing

communicates to the mother that he/she finds the interaction enjoyable and that he/she would like it to continue. The infant who displays facial expressions of anger and cries communicates to the mother that he/she is dissatisfied with the interaction and conveys the message "change what you are doing". A second assumption made by this model is that although infants have at their disposal a number of ways to regulate affect, physiology, and social and object interactions on their own, infants are immature, have limited regulatory resources, and need help maintaining interpersonal and object engagement and self-regulation. To the extent that the mother is able to interpret the infant's behavior and affect and respond appropriately, she can make the infant's self-regulatory tasks easier and help the infant sustain social and object engagement. Thus the infant's social partner plays a crucial role in enhancing or disrupting the infant's emotional experiences and ability to coordinate internal and external regulation.

Hypotheses

Based on Malatesta and Haviland's hypotheses, the Mutual Regulation Model, and the literature on sex differences one can hypothesize that mothers will use different strategies to help males and females maintain

internal and external regulation. Mothers may be more likely to engage in caregiving strategies that preclude upsetting males' more fragile emotional equilibrium. Thus they may be more likely to use proximal behaviors such as comforting, holding, and touching. They may also refrain from engaging in arousing games and may limit both the range and type of facial expressions they display to their male infants. In contrast, since females have a slower peak of excitement and are more tolerant of arousal, it is possible that mothers can afford to engage in more varied behavior, facial expressions, and play. Furthermore, since females may be better at regulating their emotional and physiological states on their own, mothers may need to engage less in proximal regulatory behaviors and may instead provide more distal stimulation such as vocalizations to their daughters.

CHAPTER 2

METHODS

Subjects

81 6-month-old infants (43 females and 38 males) and their mothers participated in this study. All infants and mothers were videotaped in Tronick's Still-Face Paradigm when the infants were 6 (range was 5 months 3 weeks to 6 months 1 week) and 6 1/2 months (range was 6 months 1 week to 6 months 3 weeks). The infants were healthy full-term caucasians from intact homes. Subjects were recruited through birth announcements published in local newspapers in the Northampton/ Amherst, Massachusetts, area. Potential participants were sent a letter describing the study and were then telephoned. Mothers who expressed interest in participating in the study were scheduled to bring their infant to the laboratory at a time when they thought their infant would be alert.

Thirteen subjects were excluded from the final sample or dropped out of the study after the first visit. One subject was dropped from the sample because of technical problems (i.e., the second visit was not videotaped). Four mothers discontinued filming because they thought the infant was too upset to continue. The other eight mothers did not show for the second visit for a number of reasons

including a death in the family (one mother), they were no longer interested in the study, or they could not come to the laboratory within the two week period during which the infant had to be seen.

Laboratory Setting and Procedures

The laboratory consisted of a video studio and an adjoining equipment room. The studio was equipped with an infant seat mounted on a table, an adjustable stool for the mother, two cameras, a microphone, and an intercom. One camera was focused on the infant and one on the mother. Both pictures were transmitted through a digital timer and split-screen generator into a single videorecorder in order to produce simultaneous frontal views of the mother and the infant. The digital timer, split-screen generator, and videorecorder were located in the equipment room in which the experimenter timed the episodes and gave the mother instructions via the intercom.

When the mother and infant arrived at the laboratory, they were greeted by an experimenter and escorted to the equipment room. During the first visit, informed written consent was obtained from the mother for her own and her infant's participation. The mother was then asked questions about the infant's perinatal status, general health, and various demographic data about the family.

During both visits, the mother and infant were then escorted to the videoroom, and the infant was placed in the infant seat. The mother and infant were videotaped during a 2-minute face-to-face play interaction for which the mother was instructed to play with the infant. This episode was followed by a 2-minute still-face interaction for which the mother was instructed to look at the infant but not to talk or touch the infant, and a second 2-minute reunion play interaction. At the end of the second session the mothers viewed the videotapes of the interactions. The laboratory procedures were identical at both visits. At both visits, the mothers were given the following instructions for the videotaping of the Still-Face Paradigm:

> " This is the videoroom in which you and your baby will be videotaped. (Name of infant) will be placed in the infant seat and you will be sitting in the chair in front of him/her. During the filming I will be in the next room and I will tell you what to do via the intercom. First, I will ask you to turn your back to (name of infant) for 15 seconds. After the 15 seconds, I will ask you to turn around, face (name of infant), and play with him/her in any way you want for 2 minutes. Then I will ask you to turn around again for 15 seconds. After this period, I will ask you to turn around, face (name of infant), and hold a still-face for 2 minutes. Try to hold a poker face and try not to smile, talk, or touch (name of infant). After the still-face you will turn your back to (name of infant) for 15 seconds, and then you will play with him normally - in any way you want. If you feel uncomfortable at any time during the filming or if (name of infant) becomes too upset, just tell me and we'll stop. Do you have any questions before we begin?"

Coding of Data

Infant Behavior

The infants' behavior during both visits was coded using the Infant Regulatory Scoring System (IRSS; Gianino, 1982, 1985). The IRSS was derived from Tronick's Modified Monadic Phase Scoring System (Tronick, Als, & Brazelton, 1980), observations by Brazelton and his colleagues (Brazelton et al., 1974) of the young infant's coping repertoire, and Gianino's (1982) research on self-comforting and exploratory behavior. The system codes eight dimensions of infant behavior: Social Engagement, Object Engagement, Scans, Signaling, Self-Comforting, Distancing, Inhibition, and Distress Indicators (See Appendix A for a complete description of codes). The Social Engagement, Object Engagement, and Scan codes are mutually exclusive, whereas the other codes can co-occur. It should be noted that all mothers are instructed not to use any toys during the Still-Face Paradigm. Therefore, object engagement refers to the infant looking at the chair, infant strap, clothing, and so on.

The coding was done by three coders from videotapes using 1 second time intervals. One coder scored Object and Social Engagement and Scans, another Signaling, and a third Self-Comforting, Distancing, Inhibition, and Distress

Indicators. A digital time display was used to track the intervals. This produced an absolute frequency count of the behaviors and maintained their temporal sequence to within a 1 second interval. The tape was run at normal speed although it was frequently stopped or run in slow motion to accurately determine the beginning and ending of shifts in infant behavior. Interobserver reliability ranged from 75% to 100%.

Infant Facial Expressions

The infants' facial expressions during both visits were scored using Izard's AFFEX system (Izard & Dougherty, 1980). AFFEX identifies ten discrete emotions as well as blends of emotions. The ten discrete emotions are: Interest, Joy, Surprise, Sadness, Anger, Contempt, Fear, Shame/Shyness/Guilt, Distress, and Disgust. The tapes were scored using 1 second time intervals by coders who had been trained with Izard's training tapes and manuals, and who were unfamiliar with the IRSS used to code the infants' behavior (See Appendix B). Interobserver reliability was established for the coding of the facial expressions of joy (89%), interest (95%), sadness (82%), and anger (89%).

Maternal Behavior

The mothers' behavior during the first visit was coded with the Maternal Regulatory Scoring System (Tronick & Weinberg, 1989). The MRSS was designed to capture the facilitative or disruptive qualities that characterize mothers' interactions with their infants. The system assesses the facilitative nature of the mothers' behavior by looking at, for instance, the extent to which a mother allows the infant to take the lead and pursue his/her goals without interfering (e.g., sharing attention to the same object); the extent to which the mother is capable of engaging the infant in positive social interchanges (e.g., looking at infant, positive vocalizations, avert games); her ability to soothe or distract the infant (e.g., comforting; eliciting the infant's attention to an object or to self); and, affectionate physical displays (e.g., kissing, touching). The system also assesses maternal behaviors that may be disruptive to the infant such as hostile and intrusive behaviors (e.g., poking/jabing, pinching, pulling the infant); interference with the infants' goal directed behavior (e.g., repositioning self in the infant's line of vision when the infant is engaged with an object); or withdrawal from the infant (e.g., leaning back in chair, gaze aversion).

The coding was done second by second from videotapes. One coder scored Proximity to Infant and Caregiving; another Social and Object Engagement, Avert, and Object Elicit; a third Vocalizations and Comforting; and a fourth, Touch and Other Specific Behaviors (See Appendix C for the complete system). Interobserver reliability was calculated and maintained at over 75% for each behavioral code. The codes of Comforting (61%), Infant Body Elicit (67%), and Emphatic/Comforting Utterances (57%) were the only codes which did not meet the minimum criterion of 75% reliability. These codes were excluded from all statistical analyses.

Maternal Affect

The mothers' facial expressions during the first visit were coded using a slightly modified version of Emde's Maternal Hedonic Tone Scale. This system rates maternal affective expressions on a 7-point scale ranging from high positive to neutral to high negative expressions. Scoring was done second by second (See Appendix D for the complete scale) and interobserver reliability was maintained at 75% or higher.

Combining the data from the IRSS, the AFFEX system, the MRSS, and the Maternal Hedonic Tone Scale provided a record of the infants' and mothers' ongoing behavior and

facial expressions of emotion. Both records were on the same time scale which allowed for the evaluation of the temporal relations among the infants' and mothers' behavior and facial expressions. Finally, it should be noted that all coders were blind to the hypotheses of the study.

Reliability

10 visit 1 play 1 episodes, 10 visit 1 still-face episodes, and 10 visit 1 reunion play episodes; AND 10 visit 2 play 1 episodes, 10 visit 2 still-face episodes, and 10 visit 2 reunion play episodes were recoded by the experimenter in order to calculate interobserver reliabilities for the infant affective and behavioral codes. Similarly, 10 play 1 and 10 reunion play episodes were recoded to calculate interobserver reliability for the mothers' affective and behavioral displays. This constitutes approximately 12% of the data for each episode. Appendix E presents the interobserver reliability for each code of the four scoring systems combining visits and episodes.

For each code, reliability was calculated using an absolute-time method. For an agreement to occur, both coders needed to have scored the same behavior or facial expression during the same 1 second time interval. Interobserver reliability was then calculated by dividing

the number of agreements by the number of agreements plus disagreements. All disagreements were resolved and the data changed to reflect this agreement.

CHAPTER 3

RESULTS AND DISCUSSION

Sex and Episode Differences in Infant Affect and Behavior

This section addresses the first two questions posed in the introduction: 1) Do male and female infants display different facial expressions during the Still-Face Paradigm?, and 2) do male and female infants react differently to the different episodes of the paradigm? The two questions are evaluated together because the same statistical analysis addresses both questions. The section begins with a descriptive presentation of the overall frequencies of infant affective and behavioral displays during visit 1. This section is followed by a second section evaluating sex differences in infant facial expressions and behavior, and by a third section addressing the infants' reactions to the three experimental contexts.

Overall Frequencies of Infant Facial Expressions and Behavior during Visit 1

The mean proportions of time, standard deviations, and number of male and female infants who displayed the AFFEX-coded facial expressions during Visit 1 are presented in

Table 2. As can be seen in this table, both male and female infants displayed primarily facial expressions of joy, interest, sadness, and anger. For both sexes facial expressions of interest were the most prominent accounting for 55% of all male facial expressions and 68% of all female facial expressions. The facial expressions of surprise, fear, disgust, contempt, and blends of positive and negative emotions occurred infrequently in both groups. The expressions of distress and shame/guilt/shyness were not observed.

Facial expressions of fear, shame/guilt/shyness, contempt, and disgust in response to non-gustatory stimuli are not expected in infants of this age. Izard (1978) proposes that these expressions do not emerge until the infant has begun the process of differentiating self from other and has acquired at least a rudimentary ability to generate cognitions about the self. Similarly, if emotional blends are developmentally more advanced as has been suggested by Izard (personal communication), then the low frequency of these displays indicate that 6-month-old infants are not yet typically engaging in this form of expression. Finally, the low incidence of surprise and the absence of distress, AFFEX expressions seen in infants of this age, suggest that the experimental conditions in this study did not elicit these expressions.

Table 2

Mean Proportions of Time (MP), Standard Deviations (SD), and Number of Male and Female Infants who Displayed the AFFEX-Coded Facial Expressions during Visit 1

	MALE (N=38)			FEMALE (N=43)		
Facial Expression	MP	SD	N	MP	SD	N
Joy[b]	.26	.26	37	.16	.19	43
Interest	.55	.28	38	.68	.22	43
Sadness	.03	.08	22	.02	.07	23
Anger	.07	.16	27	.03	.08	27
Surprise	.00	.00	4	.00	.00	3
Fear	.00	.00	0	.00	.00	1
Disgust	.00	.00	0	.00	.00	1
Distress	.00	.00	0	.00	.00	0
Contempt	.00	.00	1	.00	.00	1
Shame/Guilt/Shyness	.00	.00	0	.00	.00	0
Blend Negative	.02	.06	17	.01	.03	14
Blend Positive	.00	.00	6	.00	.00	5
Noncodable	.01	.01	16	.00	.01	13
Obscure	.07	.10	36	.09	.12	37

[a] Counts at 1 second intervals

[b] AFFEX codes are mutually exclusive

Table 3 presents the mean proportions of time, standard deviations, and number of male and female infants who displayed the IRSS-coded behaviors during Visit 1. Both male and female infants spent a substantial amount of time looking at the mother, at objects, and scanning. The infants signaled to the mother by using primarily neutral/positive and fussy vocalizations and gestures other than pick-me-up. They also self-comforted by sucking on their fingers/hands or on objects. Distancing and arousal indicators were relatively infrequent for both groups. Neither male nor female infants pushed the mother away or displayed any postural collapsing or perceptual inhibition. To the extent that these behaviors reflect an ambivalent conflict of approach/avoidance (Main, 1986), they do not appear to be elicited from these 6-month-olds in the Still-face Paradigm.

In order to have sufficient data for each affective and behavioral display and to simplify the statistical analyses, facial expressions and behaviors that occurred less than 3% of the time were eliminated. Thus the AFFEX expressions of surprise, fear, disgust, distress, contempt, shame/guilt/ shyness, and blends of positive and negative expressions were excluded from further analyses. Similarly, several IRSS-coded behaviors were eliminated including selfgrasp, rock, screenout, push away, and postural

Table 3

Mean Proportions of Time (MP), Standard Deviations (SD), and Number of Male and Female Infants who Displayed the IRSS-Coded Behaviors during Visit 1

	MALE (N=38)			FEMALE (N=43)		
Behavior	MP	SD	N	MP	SD	N
Look at Mother[b]	.36	.24	38	.31	.24	43
Look at Objects	.35	.23	38	.45	.23	43
Scans	.20	.12	38	.19	.11	43
Signals	.47	.45	38	.26	.27	43
Neutral/Positive Vocalizations	.12	.17	35	.06	.08	41
Fussy Vocalizations	.09	.16	23	.04	.08	29
Crying	.04	.15	8	.01	.06	5
Pick-me-up Gestures	.04	.09	24	.01	.05	14
Gestural Signals	.18	.20	37	.14	.18	43
Self-Comforting	.07	.13	29	.11	.18	37
Mouth Body Part	.03	.09	19	.05	.15	23
Mouth Object	.04	.10	15	.06	.11	30
Selfgrasp	.00	.01	6	.01	.02	9
Rock	.00	.00	1	.00	.01	1
Distancing	.03	.07	29	.01	.03	21
Screenout	.00	.02	5	.00	.00	1
Get Away/Escape	.03	.07	24	.01	.03	20
Push Away	.00	.00	0	.00	.00	0
Arousal Indicators	.04	.10	28	.04	.10	27
Postural Collapse	.00	.00	0	.00	.00	0
Perceptual Inhibition	.00	.00	0	.00	.00	0

[a] Counts at 1 second intervals

[b] Gaze behaviors (i.e, Look at Mother and Objects and Scans) are mutually exclusive.

collapse although some of these codes were still utilized in the larger more inclusive categories of self-comforting (i.e., mouth body part and objects, selfgrasp, and rock) and distancing (screenout and get away/escape).

Although the frequency of obscure expressions, that is expressions that were not codable for technical reasons, exceeded the cutoff score of 3%, this code was excluded from further analyses. Both obscure and noncodable AFFEX codes are of little theoretical value. Nevertheless, t-tests were used to ascertain that there were no sex differences for either code before they were dropped from subsequent analyses. The frequency of obscure expressions did not differ by sex ($t=-1.23$, $DF=238$, $p<.2220$). This indicates that the AFFEX system can be employed equally effectively in coding the facial expressions of boys and girls. Similarly, there were no sex differences in terms of noncodable expressions ($t=1.14$, $DF=202$, $p<.2572$) suggesting that both the boys and girls seldom displayed facial expressions that could not be captured by the AFFEX system. Overall, 91% of the male infants' facial expressions and 89% of the female infants' expressions met all the criteria for the fundamental emotions as specified by the AFFEX system.

Sex Differences in Infant Facial Expressions and Behavior

A 2 (sex) x 3 (episode) repeated measures ANOVA using MANOVA test criteria to control for the number of dependent variable tests was used to evaluate 1) if there were sex-related differences in the infants' affective and behavioral displays, and 2) if there were sex differences in the infants' reactions to the different episodes of the Still-Face Paradigm. To evaluate the hypothesis of overall sex differences in affect and behavior, the repeated measures portion of the ANOVA for episodes was omitted for consideration and only the effects of gender were considered (The episode effects and interactions are reported in the next section). The ANOVA was carried out using both frequency and duration data for each facial expression and behavior. For the frequency measure, the ANOVA used proportion means for each subject as the unit of analysis. In the case of the duration data, the mean duration of each infant's facial and behavioral displays was employed. The Huynh-Feldt Epsilon Statistic, which is more conservative than regular p levels, was used to determine the significance level of all F values.

A number of main effects for sex in the frequency of occurrence of the infants' facial expressions and behaviors were found (Tables 4 and 5 present the mean proportions of time, and standard deviations male and female infants

Table 4

Mean Proportions of Time (MP) and Standard Deviations (SD) Male and Female Infants Displayed the AFFEX-Coded Facial Expressions during Play 1, the Still-Face, and the Reunion Play (Visit 1)

Facial Expressions		Play 1		Still-Face		Reunion Play		Overall F for Gender	Overall F for Episode
	SEX	MP	SD	MP	SD	MP	SD		
Joy	M	.35	.26	.09	.12	.32	.28	7.34**	
	F	.20	.19	.04	.07	.26	.21		
	M+F	.27a	.24	.06b	.10	.29a	.25		10.45**
Interest	M	.55	.26	.64	.27	.45	.27	9.93**	
	F	.67	.20	.76	.22	.61	.22		
	M+F	.61a	.23	.71b	.25	.53c	.26		3.42*

Continued, next page

* p<.05 M = Male

** p<.01 F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 4 (Continued)

Facial Expressions	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Sadness	M	.01	.01	.05	.12	.04	.07	0.39	
	F	.01	.01	.04	.11	.02	.05		
	M+F	.01	.01	.05	.11	.03	.06		1.62
Anger	M	.02	.08	.11	.20	.09	.17	4.35*	
	F	.01	.05	.04	.09	.04	.11		
	M+F	.02a	.07	.07b	.15	.07b	.14		3.74*

* p<.05 M = Male

** p<.01 F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5

Mean Proportions of Time (MP) and Standard Deviations (SD) Male and Female Infants Displayed the IRSS-Coded Behaviors during Play 1, the Still-Face, and the Reunion Play (Visit 1)

Behaviors		Play 1		Still-Face		Reunion Play		Overall F for Gender	Overall F for Episode
	SEX	MP	SD	MP	SD	MP	SD		
Look at Mother	M	.35	.25	.26	.14	.48	.27	1.94	
	F	.32	.25	.21	.14	.41	.27		
	M+F	.33a	.25	.23b	.14	.44c	.27		3.16*
Look at Objects	M	.35	.23	.45	.20	.25	.22	7.90**	
	F	.44	.23	.56	.18	.35	.23		
	M+F	.40	.24	.51	.20	.30	.23		2.10

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* p<.05 M = Male

** p<.01 F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Scans	M	.19	.11	.26	.13	.15	.10	0.18	
	F	.20	.12	.22	.12	.15	.09		
	M+F	.19a	.12	.24b	.12	.15c	.10		5.15**
Signals	M	.32	.40	.35	.32	.74	.48	15.74**	
	F	.16	.15	.15	.18	.46	.33		
	M+F	.24a	.30	.25a	.27	.59b	.43		9.22**

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* p<.05 M = Male

** p<.01 F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Neutral/Positive Vocalizations	M	.11	.16	.07	.08	.19	.21	9.46**	
	F	.04	.05	.04	.04	.11	.11		
	M+F	.07a	.12	.05a	.06	.15b	.17		7.13**
Fussy Vocalizations	M	.05	.13	.09	.13	.13	.20	6.73**	
	F	.02	.03	.03	.07	.07	.11		
	M+F	.03	.09	.06	.11	.10	.16		2.01

Continued, next page

* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Crying	M	.00	.01	.02	.09	.09	.24	3.54*	
	F	.00	.00	.01	.05	.02	.09		
	M+F	.00a	.01	.02a	.07	.05b	.18		5.51*
Pick-Me-Up Gestures	M	.02	.06	.06	.08	.05	.12	5.73*	
	F	.00	.01	.02	.06	.02	.07		
	M+F	.01	.04	.04	.07	.04	.09		2.97

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* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Gestural Signals	M	.14	.20	.12	.14	.27	.21	2.36	
	F	.11	.12	.06	.07	.24	.24		
	M+F	.12	.16	.09	.11	.26	.23		1.64
Self-Comforting	M	.09	.13	.04	.07	.09	.17	2.21	
	F	.11	.18	.12	.20	.11	.15		
	M+F	.10	.16	.08	.16	.10	.16		2.34

Continued, next page

* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Mouth Body Part	M	.04	.10	.02	.04	.04	.11	0.81	
	F	.05	.16	.05	.16	.06	.13		
	M+F	.04	.13	.05	.12	.05	.12		0.83
Mouth Object	M	.05	.10	.02	.06	.05	.12	1.15	
	F	.06	.11	.06	.14	.05	.08		
	M+F	.05	.11	.04	.11	.05	.10		1.29

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* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Distancing	M	.02	.03	.05	.09	.04	.08	6.40**	
	F	.00	.01	.02	.05	.01	.01		
	M+F	.01a	.03	.03b	.07	.02b	.05		3.32*
Get Away/Escape	M	.01	.03	.05	.09	.03	.07	5.08*	
	F	.00	.01	.02	.05	.01	.01		
	M+F	.01	.02	.03	.07	.02	.05		3.10

Continued, next page

* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 5 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for Gender	Overall F for Episode
Distress Indicators	M	.01	.02	.06	.10	.04	.15	0.01	
	F	.01	.02	.04	.08	.06	.16		
	M+F	.01	.02	.05	.09	.05	.15		1.01

* p<.05

** p<.01

M = Male

F = Female

Note: Proportion means with differing letters are significantly different from each other at p<.05

displayed the facial expressions and behaviors as well as the overall F values for gender). As can be seen in Table 4, there were significant sex differences for the facial expressions of joy, interest, and anger. Boys displayed significantly more joy and anger than girls whereas girls showed significantly more interest than boys. There was no significant gender difference in the frequency of sad facial expressions.

There were also significant sex differences in the frequency of a number of IRSS-coded behaviors (See Table 5). Specifically, although boys and girls looked at the mother and scanned equally often, girls looked at objects significantly more than boys. Male infants, on the other hand, signaled their mothers more frequently and were nearly twice as likely to use neutral/positive vocalizations than girls. Boys were also significantly more fussy, cried more often, and wanted to be picked up twice as often as girls. Male infants were also more likely to attempt to distance themselves from the mother by arching their back and turning and twisting in the chair. Interestingly, there were no differences in boys' and girls' ability to regulate their state of physiological arousal. Both sexes displayed arousal indicators (i.e., spitting up, hiccuping, tongueing) equally often.

There were no significant gender differences in the duration of the infants' facial expressions and behaviors

(Tables 6 and 7 present the mean durations of the facial expressions and behaviors as well as the overall F values for gender). Since bout length can be interpreted as an index of the number of times infants switch between emotional and behavioral states, the lack of significant sex differences in the average duration of displays implies that there was no difference in lability of state for boys and girls. The lack of significant sex differences also suggest that even though male and female infants display differential frequencies of particular facial expressions or behaviors, when they display a specific affect or behavior they do so for equal amounts of time. For example, although girls are less frequently fussy than boys, their fussy displays last as long as those of boys.

In summary, several of the hypotheses proposed in this part of the study were supported. Boys displayed facial expressions of anger, and fussed and cried more than girls. Female infants, on the other hand, appeared more organized or calmer than male infants. They fussed and cried less frequently, and displayed less anger. Furthermore, although they were less likely to express joy and use neutral/positive vocalizations than males, female infants displayed interest expressions significantly more often than males. Contrary to expectation, however, there were no sex differences in emotional or state lability. Similarly, there were no sex differences in either the

Table 6

Mean Duration of Facial Expressions (MD) during Play 1, the Still-Face, and the Reunion Play (Visit 1)

Facial Expressions	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Joy	M	5.79	6.36	3.01	3.08	5.81	7.46	1.71	
	F	4.68	4.94	2.82	5.70	5.09	6.74		
	M+F	5.30a	5.81	2.94b	4.15	5.45a	7.11		4.53*
Interest	M	7.03	9.73	9.11	12.92	5.97	9.47	3.52	
	F	9.17	12.12	13.62	19.39	8.33	11.71		
	M+F	8.14	11.07	11.25	16.46	7.21	10.76		0.25

Continued, next page

* $p<.05$ M = Male

F = Female

Note: Means with differing letters are significantly different from each other at $p<.05$

Table 6 (Continued)

Facial Expressions	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Sadness	M	1.83	1.03	2.65	2.69	2.95	2.79	0.71	
	F	1.71	0.99	3.33	3.94	2.55	2.50		
	M+F	1.77	0.99	2.94	3.29	2.76	2.65		0.48
Anger	M	3.63	5.47	3.36	4.74	4.04	7.11	0.24	
	F	2.76	3.02	2.83	3.52	2.95	2.21		
	M+F	3.24	4.51	3.20	4.40	3.57	5.56		0.39

* $p<.05$ M = Male

F = Female

Note: Means with differing letters are significantly different from each other at $p<.05$

Table 7

Mean Duration (MD) of the IRSS-Coded Behaviors during Play 1, the Still-Face, and the Reunion Play (Visit 1)

Behaviors		Play 1		Still-Face		Reunion Play		Overall F for Gender	Overall F for Episode
	SEX	MD	SD	MD	SD	MD	SD		
Look at Mother	M	4.43	7.17	3.03	3.10	5.59	9.46	0.34	
	F	4.06	7.56	2.66	3.14	5.14	9.44		1.70
	M+F	4.24	7.37	2.85	3.12	5.36	9.44		
Look at Objects	M	5.95	5.57	6.53	6.83	5.38	6.32	0.09	
	F	6.62	6.62	7.10	6.53	5.66	5.61		0.31
	M+F	6.33	6.19	6.86	6.66	5.55	5.90		

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* p<.05

** p<.01

M = Male

F = Female

Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Scans	M	2.60	2.06	2.63	2.37	2.04	1.69	2.21	
	F	2.32	2.03	2.53	2.08	2.08	1.86		
	M+F	2.44a	2.05	2.49a	2.22	2.06b	1.78		4.29*
Signals	M	6.04	15.80	5.34	6.99	10.71	21.98	3.71	
	F	3.71	4.88	3.54	6.24	6.75	14.68		
	M+F	4.91	11.89	4.58	6.73	8.63	18.59		1.90

Continued, next page

* p<.05 M = Male

** p<.01 F = Female

Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Neutral/Positive Vocalizations	M	3.12	3.06	2.29	1.78	3.67	3.87	0.99	
	F	2.12	2.74	1.67	1.31	2.80	3.33		
	M+F	2.74	2.98	2.00	1.61	3.28	3.66		1.02
Fussy Vocalizations	M	4.84	4.99	3.67	3.75	5.26	5.31	0.51	
	F	2.55	1.86	3.00	3.16	4.37	3.93		
	M+F	3.96	4.22	3.45	3.57	4.88	4.77		0.86

* p<.05

** p<.01

M = Male

F = Female

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Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Crying	M	9.00		4.77	7.71	19.33	30.01		
	F	1.00	0.00	18.00	24.04	13.00	27.45		
	M+F	5.00	5.66	5.88	9.66	17.93	29.07		
Pick-Me-Up Gestures	M	5.00	6.90	3.19	2.24	4.34	4.94	0.04	
	F	1.22	0.44	2.97	5.79	5.32	4.49		
	M+F	3.58	5.70	3.12	3.65	4.59	4.82		2.36

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* p<.05 M = Male

** p<.01 F = Female

Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Gestural Signals	M	4.65	11.33	3.10	4.01	5.02	7.44	0.07	
	F	3.62	4.50	2.40	2.16	5.49	10.90		
	M+F	4.11	8.45	2.81	3.38	5.24	9.26		1.07
Self-Comforting	M	5.44	7.18	3.22	4.08	6.71	10.65	0.70	
	F	6.15	9.66	5.87	7.59	6.18	7.86		
	M+F	5.84	8.64	4.98	6.72	6.39	9.06		0.29

Continued, next page

* p<.05

** p<.01

M = Male

F = Female

Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Mouth Body Part	M	6.96	10.84	4.31	4.67	6.13	9.55	2.24	
	F	10.77	17.51	6.78	8.56	8.58	11.28		
	M+F	8.75	14.32	6.07	7.69	7.39	10.47		0.42
Mouth Object	M	4.69	4.04	3.63	4.21	7.19	11.82	1.74	
	F	5.10	4.88	4.79	4.95	4.90	4.67		
	M+F	4.93	4.53	4.47	4.76	5.76	8.12		0.19

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* p<.05 M = Male

** p<.01 F = Female

Note: Means with differing letters are significantly different from each other at p<.05

Table 7 (Continued)

Behaviors	SEX	Play 1 MD	Play 1 SD	Still-Face MD	Still-Face SD	Reunion Play MD	Reunion Play SD	Overall F for Gender	Overall F for Episode
Get Away/Escape	M	1.45	1.04	2.92	5.20	2.38	2.22		
	F	1.29	0.73	2.28	2.44	1.42	0.93		
	M+F	1.41	0.97	2.69	4.43	2.10	1.97		
Distress Indicators	M	2.15	1.83	3.45	4.61	5.97	19.37	0.61	
	F	2.19	2.02	4.38	6.62	3.95	12.28		
	M+F	2.17	1.91	3.80	5.44	4.52	14.59		0.01

* p<.05

** p<.01

M = Male

F = Female

Note: Means with differing letters are significantly different from each other at p<.05

frequency or duration of arousal indicators suggesting that infants of both sexes were equally effective in regulating physiological states of arousal.

The hypothesis that male infants would display either fewer or more frequent but less effective self-regulatory strategies was only partially supported. There was no evidence that males displayed more gaze aversion or scanning than females. Similarly, girls were no more likely than boys to use self-comforting strategies such as sucking on a thumb or on objects. However, females looked at objects significantly more often than males. Tronick (1989) has suggested that looking at objects allows infants to regulate negative affect and arousal. Thus diverting attention away from the mother to objects may have been an important form of coping employed by the female infants in this study. Male infants, on the other hand, engaged in significantly more distancing than female infants. They attempted to escape/get away from the mother by arching their back and twisting and turning in the chair. Thus, it is possible that male and female infants use different types of self-regulatory strategies with females looking at objects and males displaying more distancing from the mother. As was suggested in the introduction, these types of regulatory behaviors are very different from one another. When girls divert their attention away from the mother and look at objects they give up social engagement

but sustain an engagement with the inanimate environment. When boys distance themselves by trying to get away they sacrifice both social and object engagement.

The data support the hypothesis that females would be more likely to incorporate objects into social interactions than males. The data clearly show that females look at objects more than males. If the ability to focus on objects is a developmental achievement, as well as a regulatory strategy, this finding might support the idea that girls are developmentally more advanced than boys.

Finally, boys and girls appear to show different interactive styles during the Still-face Paradigm. Girls, although they do look at and signal the mother, spent nearly half the time looking at objects (45%) and nearly 70% of the time showing interest. In contrast, the boys appeared more focused on the mother than on objects. Much of their behavior was directed towards maintaining a positive social interaction with the mother (e.g., facial expressions of joy, neutral/ positive vocalizations) or in signaling to the mother that something was wrong as evidenced by the high rates of angry facial expressions, fussy and crying vocalizations, pick-me-up gestures, and attempts at distancing.

Sex Differences in Infants' Reactions to Experimental Contexts: Normal Face-To-Face Play, the Still-Face, and Reunion Face-To-Face Play

The 2(sex) x 3(episode) repeated measures ANOVA did not reveal any significant gender by episode interactions. This finding indicates that infants of both sexes displayed similar affective and behavioral reactions in response to the different episodes of the Still-Face Paradigm and that the observed sex differences persisted across episodes. This finding refutes the hypothesis proposed in the introduction that stressful episodes will bring out more sex differences in the infants' affect and behavior.

The repeated measures ANOVA, however, revealed a number of significant main effects for episode for a number of facial expressions and behaviors (See Tables 4, 5, 6, and 7). There were main effects of episode for the facial expressions of joy, interest, and anger, and for the IRSS-coded behaviors of looking at the mother, scans, signaling, neutral/positive vocalizations, crying, and the general category of distancing. In general, infants of both sexes avoided looking at the mother, reacted with fewer and shorter periods of joy, with increases in the frequency and duration of scanning, and with more distancing and anger to the still-face episode. There was also a significant increase in the frequency of facial expressions

of interest during the still-face as compared to the other episodes suggesting that this episode may require more information processing on the infants' part presumably because of its novelty.

During the reunion play episode, there was a general trend for positive mother oriented behaviors (e.g., facial expressions of joy, looking at the mother, signaling, and neutral/positive vocalizations) to occur significantly more than during the other two episodes. At the same time the infants continued to display high levels of crying, anger, and distancing. This suggests that the infants were ready to interact and maintain a positive involvement with the mother after her resumption of normal maternal behavior in the reunion episode and that there was a carryover effect of negative affect or at least affective arousal from the still-face into the reunion episode.

Thus, although gender differences were found across episodes, male and female infants reacted very similarly to the first play, the still-face, and the reunion episodes. There was no evidence supporting the hypotheses that sex differences would be most pronounced during the reunion play, that females would become more distressed during the still-face, and that males would react more negatively to the reunion play. Similarly, there were no data to support the hypothesis that the still-face and particularly the reunion play episode would reveal more sex differences in

regulatory capacity. The data however support previous research demonstrating the stressful nature of these two episodes (Weinberg & Tronick, 1991a, 1991b). During the still-face, infants of both sexes showed significantly more negative and fewer positive affective and behavioral displays than during the first play. During the reunion play the infants showed a rebound of positive person-oriented displays. At the same time, however, they continued to display high levels of anger, crying, and distancing. These data support the assumption previously made by Weinberg and Tronick of increased stress and arousal during the reunion play. During this episode both negative and positive emotions and behaviors are frequent. This may be due to the sudden resumption of normal maternal behavior occurring immediately after the mothers' violation of the rules of social interaction. The experience of conflicting emotions, the infant's need to reengage the mother, and to cope with the carryover effects from the still-face may place increased demands for regulation on the infant and may contribute to making the reunion episode a particularly arousing and stressful experience.

Visit Effects and Stability of Infant Affect and Behavior

This section is divided into two parts. The first section evaluates if the sex differences in infant affect and behavior found during visit 1 remain the same during a second administration of the Still-Face Paradigm. The second section assesses between-visit stability of infant affect and behavior. These sections are preceeded by a section presenting the overall frequencies of affective and behavioral displays in visit 2.

Overall Frequencies of Infant Facial Expressions and Behavior during Visit 2

Mean proportions of time and standard deviations male and female infants displayed the AFFEX-coded facial expressions during Visit 2 across episodes are presented in Table 8. Table 9 presents the data for the IRSS-coded behaviors. As was the case during visit 1, the infants displayed primarily facial expressions of joy, interest, sadness, and anger. The other facial expressions occurred rarely or not at all. Again, there were no sex differences for the noncodable ($t=1.30$, $DF=174$, $p<.1955$) and obscure codes ($t=-.2452$, $DF=220$, $p<.8065$). Similarly, the behavioral codes of self-grasp, rock, screenout, push away,

Table 8

Mean Proportions of Time (MP), Standard Deviations (SD), and Number of Male and Female Infants who Displayed the AFFEX-Coded Facial Expressions during Visit 2

	MALE (N=38)			FEMALE (N=43)		
Facial Expression	MP	SD	N	MP	SD	N
Joy[b]	.29	.26	37	.18	.20	40
Interest	.55	.28	38	.66	.25	43
Sadness	.02	.06	19	.02	.06	16
Anger	.05	.14	24	.05	.16	22
Surprise	.00	.00	2	.00	.00	5
Fear	.00	.00	1	.00	.00	0
Disgust	.00	.00	2	.00	.00	0
Distress	.00	.00	0	.00	.00	0
Contempt	.00	.00	0	.00	.00	0
Shame/Guilt/Shyness	.00	.00	0	.00	.00	0
Blend Negative	.01	.05	13	.01	.05	15
Blend Positive	.00	.01	7	.00	.00	3
Noncodable	.01	.02	15	.01	.01	14
Obscure	.07	.12	36	.07	.10	38

[a] Counts at 1 second intervals.

[b] AFFEX codes are mutually exclusive.

Table 9

Mean Proportions of Time (MP), Standard Deviations (SD), and Number of Male and Female Infants who Displayed the IRSS-Coded Behaviors during Visit 2

	MALE (N=38)			FEMALE (N=43)		
Behavior	MP	SD	N	MP	SD	N
Look at Mother[b]	.26	.21	38	.25	.20	43
Look at Objects	.36	.23	38	.42	.21	43
Scans	.20	.12	38	.21	.11	43
Signals	.35	.40	38	.24	.32	43
Neutral/Positive Vocalizations	.09	.13	36	.05	.08	37
Fussy Vocalizations	.07	.16	21	.05	.14	18
Crying	.02	.11	5	.02	.09	8
Pick-me-up Gestures	.02	.07	18	.01	.03	17
Gestural Signals	.16	.19	38	.12	.15	42
Self-Comforting	.06	.12	27	.10	.17	33
Mouth Body Part	.02	.07	15	.05	.15	21
Mouth Object	.03	.07	14	.04	.08	23
Selfgrasp	.01	.05	15	.01	.02	6
Rock	.00	.01	2	.00	.02	2
Distancing	.02	.04	25	.02	.03	25
Screenout	.00	.00	3	.00	.01	3
Get Away/Escape	.02	.04	22	.01	.03	22
Push Away	.00	.00	0	.00	.00	0
Arousal Indicators	.04	.07	32	.05	.11	36
Postural Collapse	.00	.00	0	.00	.00	0
Perceptual Inhibition	.00	.00	0	.00	.00	0

a Counts at 1 second intervals.

b Gaze behaviors (i.e, Look at Mother and Objects and Scans) are mutually exclusive.

postural collapse, and perceptual inhibition were either rare or not observed.

For Visit 1, affective and behavioral codes occurring less than 3% of the time as well as the noncodable and obscure AFFEX expressions were excluded from further analyses. However, facial expressions of sadness and several behaviors including crying, pick-me-up gestures, mouth body part, the general category of distancing, and get away/escape occurred less than 3% of the time during Visit 2. To facilitate the statistical analyses, the decision was made not to exclude these affective and behavioral displays in order to maintain comparable data sets for both visits. Tables 10 and 11 present the mean proportions of time and standard deviations male and female infants displayed per episode the facial and behavioral displays included in the visit 1 and visit 2 data sets.

Visit Effects

To evaluate the hypothesis that infants remember the Still-Face Paradigm and that this recollection will have an impact on their affect and behavior during the readministration of the procedure two weeks later, a 2(sex)x2(visit)x3(episode) repeated measures ANOVA on the frequency of affective and behavioral displays with visits

Table 10

Mean Proportions of Time (MP) and Standard Deviations (SD) Infants Displayed the AFFEX-Coded Facial Expressions during Play 1, the Still-Face, and the Reunion Play during Visit 1 and Visit 2

Facial Expressions		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Joy							
Visit 1	M	.35	.26	.09	.12	.32	.28
	F	.20	.19	.04	.07	.26	.21
Visit 2	M	.38	.28	.10	.10	.38	.27
	F	.25	.22	.06	.10	.24	.20
Interest							
Visit 1	M	.55	.26	.64	.27	.45	.27
	F	.67	.20	.76	.22	.61	.22
Visit 2	M	.57	.28	.68	.25	.40	.24
	F	.67	.21	.77	.22	.54	.26

M = Male

F = Female

Continued, next page

Table 10 (Continued)

Facial Expressions	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD
Sadness							
Visit 1	M	.01	.01	.05	.12	.04	.07
	F	.01	.01	.04	.11	.02	.05
Visit 2	M	.00	.01	.03	.08	.03	.05
	F	.01	.02	.02	.09	.03	.07
Anger							
Visit 1	M	.02	.08	.11	.20	.09	.17
	F	.01	.05	.04	.09	.04	.11
Visit 2	M	.00	.01	.06	.14	.11	.18
	F	.01	.02	.05	.14	.09	.23

M = Male

F = Female

Table 11

Mean Proportions of Time (MP) and Standard Deviations (SD) Infants Displayed the IRSS-Coded Behaviors during Play 1, the Still-Face, and the Reunion Play during Visit 1 and Visit 2

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Look at Mother							
Visit 1	M	.35	.25	.26	.14	.48	.27
	F	.32	.25	.21	.14	.41	.27
Visit 2	M	.18	.15	.26	.18	.35	.27
	F	.21	.16	.24	.19	.31	.22
Look at Objects							
Visit 1	M	.35	.23	.45	.20	.25	.22
	F	.44	.23	.56	.18	.35	.23
Visit 2	M	.37	.24	.48	.22	.23	.17
	F	.42	.20	.51	.21	.33	.17

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Scans							
Visit 1	M	.19	.11	.26	.13	.15	.10
	F	.20	.12	.22	.12	.15	.09
Visit 2	M	.21	.12	.26	.12	.15	.11
	F	.21	.10	.24	.13	.19	.09
Signals							
Visit 1	M	.32	.40	.35	.32	.74	.48
	F	.16	.15	.15	.18	.46	.33
Visit 2	M	.22	.23	.25	.34	.59	.48
	F	.15	.17	.18	.25	.40	.42

M = Male

F = Female

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Table 11 (Continued)

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Positive Vocalizations							
Visit 1	M	.11	.16	.07	.08	.19	.21
	F	.04	.05	.04	.04	.11	.11
Visit 2	M	.08	.12	.06	.10	.12	.16
	F	.03	.06	.04	.08	.06	.09
Fussy Vocalizations							
Visit 1	M	.05	.13	.09	.13	.13	.20
	F	.02	.03	.03	.07	.07	.11
Visit 2	M	.01	.03	.07	.18	.12	.18
	F	.01	.04	.04	.09	.10	.22

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD
Crying							
Visit 1	M	.00	.01	.02	.09	.09	.24
	F	.00	.00	.01	.05	.02	.09
Visit 2	M	.00	.00	.00	.00	.06	.19
	F	.00	.00	.02	.06	.04	.15
Pick-Me-Up Gestures							
Visit 1	M	.02	.06	.06	.08	.05	.12
	F	.00	.01	.02	.06	.02	.07
Visit 2	M	.01	.02	.04	.11	.01	.04
	F	.01	.02	.02	.04	.01	.03

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors	SEX	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD
Gestural Signals							
Visit 1	M	.14	.20	.12	.14	.27	.21
	F	.11	.12	.06	.07	.24	.24
Visit 2	M	.13	.15	.08	.08	.28	.24
	F	.09	.11	.07	.09	.19	.19
Self-Comforting							
Visit 1	M	.09	.13	.04	.07	.09	.17
	F	.11	.18	.12	.20	.11	.15
Visit 2	M	.08	.13	.06	.12	.05	.10
	F	.10	.18	.08	.11	.11	.20

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Mouth Body Part							
Visit 1	M	.04	.10	.02	.04	.04	.11
	F	.05	.16	.05	.16	.06	.13
Visit 2	M	.02	.06	.02	.06	.03	.09
	F	.04	.15	.03	.08	.08	.19
Mouth Object							
Visit 1	M	.05	.10	.02	.06	.05	.12
	F	.06	.11	.06	.14	.05	.08
Visit 2	M	.05	.09	.01	.04	.02	.05
	F	.05	.10	.04	.08	.04	.07

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Distancing							
Visit 1	M	.02	.03	.05	.09	.04	.08
	F	.00	.01	.02	.05	.01	.01
Visit 2	M	.01	.02	.03	.05	.02	.05
	F	.01	.01	.02	.04	.02	.04
Get Away/Escape							
Visit 1	M	.01	.03	.05	.09	.03	.07
	F	.00	.01	.02	.05	.01	.01
Visit 2	M	.01	.02	.02	.04	.02	.05
	F	.01	.01	.02	.04	.02	.04

M = Male

F = Female

Continued, next page

Table 11 (Continued)

Behaviors		Play 1		Still-Face		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Distress Indicators							
Visit 1	M	.01	.02	.06	.10	.04	.15
	F	.01	.02	.04	.08	.06	.16
Visit 2	M	.03	.05	.06	.07	.04	.08
	F	.03	.08	.10	.15	.03	.06

M = Male

F = Female

and episodes as the repeated measures was conducted. A 2(sex)x2(visit)x3(episode) repeated measures ANOVA was alsocarried out using the mean duration of each infant's facial and behavioral displays. However, as had been the case in the previous section, there were few significant results in the duration data and these data did not substantially add to the picture provided by the frequency data. Thus in order to simplify the presentation of the results, the decision was made not to report the duration data.

The 2(sex)x2(visit)x3(episode) repeated measures ANOVA revealed a number of significant main effects of sex. As can be seen in Table 12, several of these main effects were the same as those found for visit 1. For the combined data of visits 1 and 2, the boys continued to display facial expressions of joy, to signal, and to use both positive and fussy vocalizations more frequently than girls. Similarly, the girls continued to display facial expressions of interest and to look at objects significantly more often than boys. There were also a number of main effects of sex that had not been significant in the previous analyses on the Visit 1 data. There were significant main effects of sex for gestural signals, with boys gesturing more than girls, and for the overall category of self-comforting, mouth body part, and mouth objects with girls using these

Table 12

Significant Main Effects of Gender

Facial Expression & Behavior	MALE (N=38) MP	SD	FEMALE (N=43) MP	SD	Overall F for Gender
Joy	.27	.26	.17	.20	28.57**
Interest	.55	.28	.67	.23	32.34**
Look at Objects	.35	.23	.44	.22	18.77**
Signals	.41	.42	.25	.29	29.33**
Positive Vocalizations	.11	.15	.05	.08	26.42**
Fussy Vocalizations	.08	.16	.05	.12	7.74**
Gestural Signals	.17	.19	.13	.16	8.20**
Self-Comforting	.07	.12	.11	.17	7.51**
Mouth Body Part	.03	.08	.05	.15	4.14*
Mouth Object	.03	.08	.05	.10	3.95*

* $p<.05$

** $p<.01$

self-regulatory strategies significantly more frequently than boys.

A number of main effects of sex found in the visit 1 data set were no longer significant when the data for visits 1 and 2 were combined. Thus there were no main effects of sex for the frequency of facial expressions of anger or crying. During visit 1, boys engaged in these negative affective displays significantly more often than girls. During visit 2, only the frequency of fussy vocalizations was higher for boys than for girls. These results suggest that the Still-Face Paradigm may have been less stressful for the boys during the second visit. This interpretation is supported by three significant visit*gender interactions for pick-me-up gestures, the overall category of distancing, and escape/get away (See Table 13). During visit 1, boys were significantly more likely than girls to use pick-me-up gestures, distancing, and escape/get away, and the frequency of these behaviors were higher for boys than girls in visit 1, but not in visit 2.

The main effects for gender and the visit*gender interactions both confirm and extend the findings from the visit 1 data. Much of the boys' behavior continued to be directed towards maintaining a positive interaction with the mother (e.g., facial expressions of joy, signals, neutral/positive vocalizations, gestural signals) whereas

Table 13

Significant Visit * Gender Interactions

Behavior	MALE (N=38) MP	SD	FEMALE (N=43) MP	SD	Overall F for G*V Interaction
Pick-Me-Up Gestures					
Visit 1	.04a	.09	.01b	.05	3.85*
Visit 2	.02b	.07	.01b	.03	
Distancing					
Visit 1	.03a	.07	.01b	.03	6.11**
Visit 2	.02b	.04	.02b	.04	
Get Away/Escape					
Visit 1	.03a	.07	.01b	.03	4.31*
Visit 2	.02b	.04	.01b	.03	

* $p<.05$

** $p<.01$

Note: Proportion means with differing letters are significantly different from one another at $p<.05$

girls continued to be more focused than boys on objects and to show facial expressions of interest. The data also support the hypothesis made earlier in the paper that girls will display more frequent self-regulatory strategies than boys. As in visit 1, the girls continued to divert their attention away from the mother and to look at objects more frequently than boys. When the data for visits 1 and 2 were combined, they also used self-regulatory strategies such as sucking on their thumb and on objects significantly more frequently than boys.

Interestingly, the Still-Face Paradigm appeared to be less stressful the second time around but only for the boys. The means for the facial expressions of anger, crying, pick-me-up gestures, the overall category of distancing, and escape/get away were significantly lower for the boys during the second visit whereas the frequency of girls' negative affect and behavior did not substantially change between visits.

Besides the reduction of negative affect and behavior in boys during the second visit, there were relatively few other significant differences between visits. There was only one main effect for visit for the overall category of signaling indicating that both boys and girls were significantly less likely to signal the mother during the second visit than during the first visit (See Table 14). Similarly, there were two visit*episode interactions

Table 14

Main Effect of Visit

Behavior	VISIT 1 MP	VISIT 1 SD	VISIT 2 MP	VISIT 2 SD	Overall F for Visit
Signals	.36	.38	.29	.36	4.46*

* p<.05

** p<.01

which suggested that although boys and girls were most likely to look at the mother and to use neutral/positive vocalizations during reunion play episodes they were less likely to do so during the reunion play of the second visit (See Table 15). These data are consistent with an interpretation that visit 2 is less stressful than visit 1. The reduction of signaling, looking at the mother, and neutral/positive vocalizations during visit 2 may indicate that the infants felt less of a need to engage the mother during this visit.

Finally, the ANOVA revealed a number of significant main effects of episode across visits (See Table 16). In general, these data were consistent with those found when looking at the first visit. Combining the data from both visits, however, served to reveal more clearly the stressful nature of the still-face and reunion play episodes to infants of both sexes. Several negative displays including facial expressions of sadness, attempts at escape, physiological arousal, fussy vocalizations, and pick-me-up gestures that were not significant in the visit 1 data were significant when the data for both visits were combined. Thus both boys and girls reacted to the still-face episode with less joy and with increases in interest, sadness, anger, scanning, object attending, pick-me-up gestures, distancing, escape attempts, and physiological arousal. During the reunion play infants of both sexes

Table 15

Significant Visit * Episode Interactions

Behaviors & Visit	Play 1 MP	Play 1 SD	Still-Face MP	Still-Face SD	Reunion Play MP	Reunion Play SD	Overall F for V*E Interactions
Look at Mother							
Visit 1	.33a	.25	.23b	.14	.44c	.27	6.29**
Visit 2	.19c	.16	.25b	.19	.33a	.24	
Positive Vocalizations							
Visit 1	.07a	.12	.05a	.06	.15b	.17	2.95*
Visit 2	.05a	.09	.05a	.09	.09c	.13	

* $p<.05$

** $p<.05$

Note: Proportion means with differing letters are significantly different from each other at $p<.05$

Table 16

Significant Main Effects of Episode

Facial Expressions & Behaviors	Play 1 Face MP	SD	Still-Play MP	SD	Reunion MP	SD	Overall F for Episode
Joy	.29a	.25	.07b	.10	.30a	.25	63.27**
Interest	.62a	.24	.72b	.25	.50c	.26	32.36**
Sadness	.01a	.01	.04b	.10	.03b	.06	10.29**
Anger	.01a	.05	.06b	.15	.08b	.18	11.71**

* p<.05

Continued, next page

** p<.01

Note: Proportion means with differing letters are significantly different from each other at p<.05

Table 16 (Continued)

Facial Expressions & Behaviors	Play 1 Face MP	SD	Still-Play MP	SD	Reunion MP	SD	Overall F for Episode
Look at Objects	.40a	.23	.50b	.21	.29c	.20	40.81**
Scans	.20a	.11	.24b	.12	.16c	.10	21.53**
Signals	.21a	.26	.23a	.29	.54b	.44	51.22**
Fussy Vocs	.02a	.07	.06b	.13	.11c	.18	16.53**
Crying	.00a	.01	.01b	.06	.05c	.17	9.48**
Pick-Up Gestures	.01a	.03	.03b	.08	.02b	.07	6.80**
Gestural Signals	.12a	.15	.08b	.10	.24c	.22	44.59**
Distancing	.01a	.02	.03b	.06	.02c	.05	7.70**
Escape/ Get Away	.01a	.02	.03b	.06	.02c	.05	7.14**
Distress Indicators	.02a	.05	.07b	.11	.04c	.12	8.39**

* $p<.05$

** $p<.01$

Note: Proportion means with differing letters are significantly different from each other at $p<.05$

showed a rebound of facial expressions of joy and signaling behaviors. At the same time, they showed negative carryover effects from the still-face as indicated by the elevated frequencies of sadness, anger, fussy vocalizations, crying, and pick-me-up gestures.

Although the second visit appeared less stressful than the first visit suggesting that the infants (at least the boys) may have remembered their experiences during their first visit, the infants still reacted strongly to the still-face and reunion play episodes. This suggests that the still-face and reunion play episodes were still stressful to the infants even though they may have remembered their first visit to the laboratory. Furthermore, the frequencies of facial expressions of interest were not significantly different between the two visits. This suggests that the second still-was still relatively novel and for lack of a better word "interesting" to the infants.

Thus the hypothesis that infants remember the still-face and that the expectation of this stress will lead to more negative affect and behavior in males as compared to females during the second visit was not supported. Although the boys appeared to remember the Still-Face Procedure, this "remembrance" had the opposite effect than the one predicted. Boys showed considerably less negative affect and behavior during visit 2 as compared to visit 1

whereas girls' negative affect and behavior did not significantly change between visits. Similarly, the hypothesis that sex differences would be more pronounced in the infants' reactions to the episodes of the Still-Face Paradigm during the second visit was not supported. The infants reacted in much the same way as in visit 1. Both sexes reacted to the still-face with decreases in positive and increases in negative displays and physiological arousal. Similarly, for both sexes, there was a rebound of both positive and negative affective and behavioral displays during the reunion play episode. This suggests that the still-face and reunion play episodes were still stressful to the infants even though they may have remembered their first visit to the laboratory. It also suggests that simple models of habituation, which would predict that the infants would be less stressed and less interested in these episodes, is not a likely explanation of the results.

Besides the reduction of negative affect and behavior in boys during the second visit, there were relatively few other significant differences between the two visits. In both visits, boys were more focused on the mother and used facial expressions of joy, signals, neutral/positive vocalizations, and gestural signals significantly more then girls. Girls looked more at objects and displayed facial expressions of interest more frequently than boys. For both

sexes, however, there was a general decrease in the use of signaling behaviors during the second visit and in particular in the frequency of looking at the mother and using neutral/positive vocalizations during the reunion play. It is possible that these reductions reflect the less stressful nature of the second visit and that the infants experienced a lesser need to reengage the mother during this visit. Finally, when the data for visits 1 and 2 were combined, girls used self-regulatory strategies such as diverting their attention away from the mother to objects, and sucking on parts of their body or on objects, significantly more frequently than boys. This finding suggests the possibility that differences in the ability to use self-regulatory strategies may be responsible for some early male/female differences and possibly that females are more developmentally advanced than males.

Stability of Infant Affect and Behavior

To assess the stability of infant affect and behavior between the two administrations of the Still-Face Paradigm at 6 months and two weeks later, Pearson Product Moment Correlations for each facial expression and behavior were conducted. Following Epstein's (1983) suggestion that stability is best seen when looked at across different experimental contexts, correlations were carried out

between Visit 1 and Visit 2 aggregating over episodes. Correlations were also carried out between the episodes of Visit 1 and Visit 2 to assess wether the infants' reactions to the first play, the still-face, and the reunion play remained stable over time.

Correlations were carried out on the frequencies as well as on the mean duration of facial expressions and behaviors. Tables 17 and 18 present the correlations on the frequencies and mean duration of facial and behavioral expressions for males and females aggregating over episodes. Tables 19 and 20 present the correlations on the frequencies and mean duration of males' and females' facial and behavioral displays between the episodes of visit 1 and Visit 2.

The correlational analyses indicated that the frequency of several facial expressions and behavioral displays were stable over the two week period aggregating over episodes (See Table 17). For the boys, facial expressions of joy and interest were positively correlated across the two visits. In addition, seven of the IRSS-coded behaviors including Look at Objects, Scans, Neutral/ Positive Vocalizations, Pick-me-up Gestures, Mouth Body Part, the overall category of Distancing, and Get Away/Escape were stable between visits 1 and 2. A similar number of significant correlations between visits and aggregating across episodes were found for the girls (See Table 17).

Table 17

Correlations on the Frequency Data between Visit 1 (6 Months) and Visit 2 (6 1/2 Months) Aggregating over Episodes for Males' and Females' Facial Expressions and Behaviors

Facial Expression & Behavior	Correlations Between V1 and V2	
	MALES	FEMALES
Joy	.55**	.52**
Interest	.47**	.43**
Sadness	-.10	.53**
Anger	-.12	.05
Look at Mother	.06	.30*
Look at Objects	.37*	.40**
Scans	.49**	.33*
Signals	.20	.08
Neutral/Positive Vocalizations	.55**	.20
Fussy Vocalizations	-.07	-.11
Crying	-.12	-.05
Pick-me-up Gestures	.39*	-.03
Gestural Signals	.27	-.01
Self-Comforting	.31	.39**
Mouth Body Part	.32*	.60**
Mouth Objects	.11	.21
Distancing	.55**	.16
Get away/Escape	.60**	.01
Arousal Indicators	-.09	.18
Number of Significant Correlations:	9/19	8/19

* $p<.05$ (two-tailed)

** $p<.01$ (two-Tailed)

Table 18

Correlations on the Mean Durations of Males' and Females' Facial Expressions and Behaviors between Visit 1 (6 Months) and Visit 2 (6 1/2 Months) Aggregating over Episodes

Facial Expression & Behavior	Correlations Between V1 and V2	
	MALES	FEMALES
Joy	.29	.14
Interest	.48**	.28
Sadness	.29	.35
Anger	.13	.30
Look at Mother	-.03	.41**
Look at Objects	.15	.18
Scans	.25	.07
Signals	.29	-.07
Neutral/Positive Vocalizations	.24	-.29
Fussy Vocalizations	.46	-.27
Crying	--	-.38
Pick-me-up Gestures	.39	-.51
Gestural Signals	.33*	-.14
Self-Comforting	-.13	.36*
Mouth Body Part	-.20	.16
Mouth Objects	.18	.44*
Distancing	.	.
Get away/Escape	.50*	.58*
Arousal Indicators	.23	.03
Number of Significant Correlations:	3/19	4/19

* p<.05 (two-tailed)

** p<.01 (two-tailed)

Table 19

Correlations on the Frequency Data between the Episodes of Visit 1 Play 1 (P1), Still-Face (SF), Reunion Play (RP) and Visit 2 Play 1 (P1), Still-Face (SF), Reunion Play (RP) for Males' and Females' Facial Expressions and Behaviors

Facial Expression & Behavior	Correlations Between V1 and V2 Per Episode MALES			FEMALES		
	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP
Joy	.60**	.45**	.30	.59**	.79**	.05
Interest	.65**	-.05	.38*	.47**	.29	.19
Sadness	-.11	-.10	-.04	.42**	.62**	.04
Anger	-.06	-.10	-.13	.04	-.07	-.09
Look at Mother	.08	.27	-.02	.03	.10	.31*
Look at Objects	.44**	.16	.35*	.44**	.16	.17
Scans	.36*	.31	.39*	.14	.27	-.13
Signals	.34*	-.12	.12	.39**	-.07	.03
Positive Vocalizations	.55**	.15	.29	.62**	.08	-.02
Fussy Vocalizations	-.09	-.17	-.08	.35*	-.10	-.08
Crying	--	-.05	-.11	-.02	-.04	-.05

Continued, next page

* p<.05 (two-tailed)

** p<.01 (two-tailed)

Table 19 (Continued)

Facial Expression & Behavior	Correlations Between V1 and V2 Per Episode MALES			FEMALES		
	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP
Pick-me-up Gestures	-.06	.19	-.01	-.10	.03	-.09
Gestural Signals	.19	.01	.24	.15	-.06	-.09
Self-Comforting	.22	.28	-.11	.39**	.27	.10
Mouth Body Part	.32*	.37*	-.01	.51**	.69**	.07
Mouth Objects	.10	.04	-.06	.21	.05	.17
Distancing	.34*	.23	.62**	-.17	.34*	.11
Get away/Escape	.39*	.26	.67**	-.15	.01	.11
Arousal Indicators	.06	-.08	.19	.17	.33*	.15
Number of Significant Correlations:	9/19	2/19	5/19	9/19	5/19	1/19

* p<.05 (two-tailed)

** p<.01 (two-tailed)

Table 20

Correlations on the Mean Durations of Males' and Females' Facial Expressions and Behaviors between the Episodes of Visit 1 Play 1 (P1), Still-Face (SF), Reunion Play (RP) and Visit 2 Play 1 (P1), Still-Face (SF), Reunion Play (RP)

Facial Expression & Behavior	Correlations Between V1 and V2 Per Episode MALES			FEMALES		
	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP
Joy	.51**	-.06	-.07	.40*	.78**	-.24
Interest	.54**	-.11	.20	.48**	.09	.14
Sadness	--	.37	.33	--	.34	.70
Anger	--	.26	.65*	.80	-.28	-.60
Look at Mother	-.02	.26	-.01	-.06	.14	.47**
Look at Objects	.26	.19	.04	.15	.19	.13
Scans	.48**	-.12	.33*	.08	.05	-.13
Signals	.03	-.03	-.04	-.01	-.12	-.10
Positive Vocalizations	.05	-.11	.10	-.20	.19	-.29
Fussy Vocalizations	-.06	-.33	.19	--	.28	.22
Crying	--	--	--	--	--	--

Continued, next page

* p<.05 (two-tailed)
** p<.01 (two-tailed)

Table 20 (Continued)

Facial Expression & Behavior	Correlations Between V1 and V2 Per Episode MALES			FEMALES		
	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP	V1P1 to V2P1	V1SF to V2SF	V1RP to V2RP
Pick-me-up Gestures	--	.67	-.55	--	-.45	--
Gestural Signals	-.04	.07	.39*	-.30	-.07	-.03
Self-Comforting	.32	-.15	-.25	-.01	.04	-.14
Mouth Body Part	-.28	-.77	-.24	--	.62	-.29
Mouth Objects	-.26	--	-.58	.97**	-.34	-.16
Distancing	.	.	.	.	.	.
Get away/Escape	.91*	-.03	.28	--	.79*	.40
Arousal Indicators	-.21	.51*	.34	-.55	-.02	.23
Number of Significant Correlations:	4/19	1/19	3/19	3/19	2/19	1/19

* p<.05 (two-tailed)
** p<.01 (two-tailed)

In addition to joy and interest, facial expressions of sadness were positively correlated between visits for girls. Five of the IRSS-coded behaviors including Look at Mother, Look at Objects, Scans, the overall category of Self-Comforting, and Mouth Body Part were also significantly correlated across time.

The mean duration data did not show as much stability as the frequency measures. It is possible that at this age how long a display lasts is more or less variable than how frequently it is displayed. Thus, for boys, only the duration of facial expressions of interest, gestural signals, and get away/escape were stable across the two visits aggregating over episodes. Similarly, for girls, only the duration of Look at Mother, the general category of Self-Comforting, Mouth Objects, and Get Away/Escape were stable over time (See Table 18).

Taken together the correlations derived from the aggregated data suggest that boys and girls show similar amounts of stability in both the frequency and duration of affective and behavioral displays. Boys had 9 significant frequency correlations and 3 significant mean duration correlations. Girls had 8 significant frequency correlations and 4 significant mean duration correlations. Boys and girls also showed stability in a number of similar domains. Thus infants of both sexes who tended to display facial expressions of joy and interest, to look at objects,

to scan, and to self-comfort by using oral strategies during the first visit also did so during the second visit. This suggests that these affective and behavioral displays are well-structured and emphasizes the degree to which these domains represent stable, characteristic, and structured interactive strategies for both sexes.

To evaluate sex differences in the stability of the infants' individual facial and behavioral displays, correlation coefficients were transformed into z scores using Fisher's r to z transformation and comparisions between independent rs for boys and girls were done by computing normal curve deviates (Cohen & Cohen, 1975). Girls showed significantly more stability than boys in the frequency of facial expressions of sadness ($z=-2.97$, $p=.0028$, two-tailed). Boys showed significantly more stability than girls in the frequency of the overall category of distancing ($z=1.97$, $p=.052$, two-tailed) and get away/escape ($z=2.94$, $p=.004$, two-tailed). There were also a number of significant sex differences in the duration data aggregated across episodes. Boys were significantly more likely than girls to show stability in the duration of their neutral/positive vocalizations ($z=2.18$, $p=.028$, two-tailed), fussy vocalizations ($z=1.94$, $p=.052$, two-tailed), pick-me-up gestures ($z=2.22$, $p=.028$), and gestural signals ($z=1.94$, $p=.052$), whereas girls showed more stability in

the time spent looking at the mother ($z=-2.01$, $p=.046$, two-tailed).

These sex differences suggest that there are affective and behavioral domains in which the two sexes differ in their level of stability and that the organization of positive and negative states are somewhat different for the two sexes. Boys' positive states, characterized by stable neutral/positive vocalizations and gestural signals, reflect stable active strategies of seeking engagement with the mother. Girls' positive states characterized by looking at the mother reflect well-organised evaluative and monitoring strategies. Similarly, boys' negative states are characterized by stable distancing strategies, fussy vocalizations and pick-me-up gestures. These displays have previously been characterized as very clear signals that something is wrong and in need of rectification and as active attempts to get away from something that is distressing (Campos et al., 1983; Weinberg & Tronick, 1991). By contrast, the girls' stable negative states are characterized by sadness. Although sadness serves to communicate that something is not right it is a subtle display of displeasure and has been described in the literature as a relatively passive or low key strategy to achieve change (Campos et al, 1983; Weinberg & Tronick, 1991).

Epstein (1983) has suggested that stability in behavior is best seen when aggregating across different experimental contexts. From this perspective, aggregating across the episodes of the Still-Face Paradigm would reveal more stability in the infants' affective and behavioral displays than looking at one episode at a time. This was the case for these data. Substantially more stability was found when looking at the aggregated data. With the exception of the first play, many more significant correlations were found in the aggregated data than in the still-face or reunion episodes alone.

The disaggregated data, however, revealed overall patterns of stability more clearly than the aggregated data (See Tables 19 and 20). For both boys and girls, the greatest amount of stability (i.e., the largest number of significant correlations) was found between play 1 visit 1 and play 1 visit 2. This is not surprising since play 1 can be seen as representing the usual, characteristic, and expectable way that mothers and infants interact. Although normal play interactions are not free of interactive errors that stress the infant, these errors are typically easily repaired or negotiated by either or both partners (Tronick & Cohn, 1989). By contrast, little stability was found for both sexes in the still-face and reunion play episodes. These episodes are not representative of what typically occurs in mother-infant interactions. The still-face is a

disruption or violation of the infants' expectations concerning social interactions that cannot be repaired by the infant. The reunion play forces both partners to renegotiate the interaction after it has been stressed. Thus since stability can be interpreted as the typical way an individual reacts to any situation, it is not surprising that in unusual circumstances infants react in less characteristic, stable, or usual ways than they do under normal circumstances. Furthermore, the fact that both boys and girls showed few stable and organized responses during the still-face and reunion episodes highlight the stressful nature of these episodes. It is possible that stable affective and behavioral responses collapse when the stress is significant.

The disaggregated data also suggest that there may be sex differences in patterns of organization or stability in response to different experimental or environmental contexts. During play 1, as in the aggregated data, both sexes showed the same amount of stability in both the frequency and duration of affective and behavioral displays as well as stability in a number of similar domains. During the still-face episode, however, boys appeared to show more stability than girls whereas during the reunion play episode girls appeared to show more stability than boys.

These data need to be considered cautiously. The disaggregated data involves a very large number of correlations and there is no control of the overall alpha level. Nevertheless the data suggest the possibility that boys and girls display differential patterns of organization or stability in response to different stresses. Specifically, the data suggest that boys may have a difficult time managing the disruption of normal interactive behavior and that they are reactive to and driven by the still-face situation. Similarly, girls may have a hard time coping with renegotiating the interaction after it has been stressed. The greater stability in the girls' reactions to the still-face and the boys' reactions to the reunion play may indicate that the girls remembered their experiences with the still-face during the first visit and that the boys remembered their experiences with the reunion play. Alternatively, it may be that girls are simply better equipped to cope with unexpected social interactive disruptions and boys with renegotiating interactive errors. Further research is necessary before the finding about differential stability in different environmental contexts can be more fully understood.

Taken together, the correlational data argue against Sroufe's and Water's (1977) argument that stress bring out more stable individual responses. Play 1, a non-stressful and typical situation for the infants, elicited

substantially more stable and characteristic responses from the infants than did the more stressful and unusual still-face and reunion episodes.

Furthermore, the hypothesis that there would be more stability in the girls' affective and behavioral displays across a two week period was not supported. In general, boys and girls showed similar amounts of stability in both affective and behavioral domains. Although boys and girls showed stability in a number of similar domains, there were also affective and behavioral domains in which the sexes differed in their level of stability. Boys' positive states were characterized by stable strategies of seeking engagement with the mother. Girls' positive states reflected stable evaluative and monitoring strategies. Similarly, boys' negative states were characterized by stable and active strategies to signal the mother to change her behavior. By contrast, girls tended to use stable low key strategies characterized by sadness to communicate to the mother to change her behavior.

Finally, the finding that there was considerable stability in both sexes' affect and behavior during both the aggregated and play 1 data points to an early structuring and organizing process and suggests that at 6 months ways of relating to a social partner are already significantly structured and organized.

Sex-Related Differences in Maternal Affect and Behavior

This section evaluates if there are differences in the types of affective and behavioral expressions mothers display to male and female infants. The section begins with a descriptive presentation of the overall frequencies of maternal affective and behavioral displays during visit 1.

Overall Frequencies of Maternal Facial Expressions and Behavior during Visit 1

The total frequencies, percentages, and number of mothers who displayed each affective facial expression code from The Maternal Hedonic Tone Scale during visit 1 are presented in Table 21. As can be seen in this table, mothers displayed primarily positive facial expressions. These expressions accounted for 91% of all facial expressions displayed by the mothers in this sample. All 81 mothers displayed high and moderately positive facial expressions and 78 mothers showed low positive expressions. Moderately positive facial expressions characterized by smiles, play and coo faces were the most prominent accounting for 37% of all facial expressions. The second most common affective displays were high positive

Table 21

Total Frequencies, Percentages, and Number of Mothers who Displayed Each Affective Facial Expression Code during Visit 1

Facial Expression	Frequency	%	Number of Mothers
High Positive	6700	34.47	81
Moderate Positive	7110	36.57	81
Low Positive	3925	20.19	78
Neutral	1005	5.17	64
Low Negative	199	1.02	24
Moderate Negative	28	0.14	6
High Negative	7	0.04	1
Unscorable	463	2.63	60
Uncodable	0	0.00	0

Note1: Counts at 1 second intervals

Note2: The maximum number of occurrences of any facial expression code is 19,440 (120 seconds per episode x 2 episodes x 81 infants)

Note: All facial expression codes are mutually exclusive

expressions (that is, laughter, giggling, broad smiles, andhighly animated and exaggerated play faces) which accounted for 35% of all facial expressions. Low positive expressions characterized by brightness in the face but no smiles and expressions of interest and attentiveness were also relatively frequent (20% of all facial expressions). Much less frequent, accounting for only 5% of all facial expressions, were neutral or bland facial expressions. Sixty-four mothers, however, displayed at least one second of neutrality or blandness suggesting that this expression occurs somewhat regularly during mother-infant interactions.

Negative facial expressions were very rare and accounted for just a little over 1% of all facial expressions. This rate is substantially lower than the rates reported in the literature for depressed mothers and emphasizes the normalcy of the present sample (Cohn, Campbell, Matias, & Hopkins, 1990; Cohn & Tronick, 1989; Field, Healy, Goldstein, & Guthertz, 1990). The rates of positive and negative facial expressions are also consistent with previous research which demonstrates that "normal" mothers rarely display negative facial expressions during interactions with their infants (Cohn & Tronick, 1987; Malatesta & Haviland, 1982). Finally, only 3% of the mothers' facial expressions were unscorable and none were uncodable suggesting that the Maternal Hedonic Tone

Scale can be effectively used to code maternal facial expressions during face-to-face interactions.

Table 22 presents the total frequencies, percentages, and number of mothers who displayed the MRSS-coded behaviors during visit 1. Overall, nearly all mothers spent most of the time looking at the infant from an average interactive distance, while vocalizing and stroking the infant. Although most mothers looked at objects the infant looked at or averted from time to time, object attend and avert occurred infrequently. This is consistent with previous research suggesting that mothers hardly ever look away from their infant during face-to-face interactions (Cohn & Tronick, 1987; Stern, 1977). Caregiving and repositioning of the infant's posture were also relatively infrequent. This suggests that the infants were well-organized and required little help from the mothers to regulate posture and other physiological processes. Finally, of interest is the near absence of hostile/intrusive behaviors. Only a handful of mothers poked, pulled, or pinched their infant. In depressed samples, more than 25% of mothers have been found to routinely engage in these behaviors (Cohn & Tronick, 1989).

In order to have sufficient data for each affective and behavioral display and to simplify the statistical analyses, only facial expressions and behaviors that

Table 22

Total Frequencies, Percentages, and Number of Mothers who Displayed Each MRSS-Coded Behavior during Visit 1

MRSS-Coded Behavior	Frequency	%	Number of Mothers
Proximity			
Nose-to-Nose	323	1.66	38
Loom	6116	31.46	74
Average	12805	65.87	81
Lean Back	190	0.98	23
Gaze			
Social Attend	16894	86.90	81
Social Glances	364	1.87	62
Avert Game	560	2.88	43
Avert Glances	0	0.00	78
Object Attend	1287	6.62	71
Object Glances	992	5.10	77
Avert	606	3.12	67
Avert Glances	902	4.64	78

Note1: Counts at 1 second intervals

Note2: The maximum number of occurrences of any MRSS-coded behavior is 19,440 (120 seconds per episode x 2 episodes x 81 infants)

Note3: The Proximity codes are mutually exclusive. So are the codes of Social Attend, Object Attend, Avert Game, and Avert.

Continued, next page

Table 22 (Continued)

MRSS-Coded Behavior	Frequency	%	Number of Mothers
Caretaking	568	2.92	46
Comforting	468	2.41	26
Elicit			
Object Elicit	34	0.17	8
Infant Body Elicit	26	0.13	11
Vocalizations			
Vocalizations	13502	69.45	81
Calls Infant's Name	518	2.66	68
Directs to Self	265	1.36	39
Comforting	400	2.06	25
Mouth Noises	1407	7.24	67
Touch			
Reposition Infant	118	0.61	31
Hold Infant	3051	15.69	72
Stroke Infant	6508	33.48	80
Poke/Jab Infant	69	0.35	10
Tickle Infant	1118	5.75	63
Pull Infant	76	0.39	14
Rhythmic Movement of Limbs	3229	16.61	76
Rock Infant	4	0.02	1

Continued, next page

Table 22 (Continued)

MRSS-Coded Behavior	Frequency	%	Number of Mothers
Touch (Continued)			
Kiss Infant	389	2.00	46
Pinch Infant	28	0.14	6
Suck on Infant	410	2.11	29
Eliciting Behaviors			
Use Objects	218	1.12	13
Make Noise	369	1.90	20
Wave	775	3.99	36
Reposition Self	1034	5.32	59
Blow on Infant	101	0.52	14

occurred 3% or more of the time were kept for further analyses. Several MRSS-coded behaviors occurred 3% or more of the time including looming proximity, average proximity,social attend, object attend, object glances, avert, avert glances, vocalizations, mouth noises, hold infant, stroke infant, tickle infant, rhythmic movement of the infant's limbs, wave, and reposition self. Similarly, low, moderate, high, and neutral facial expressions occurred sufficiently frequently to be included in the analyses.

Facial expressions and behaviors that occurred less than 3% of the time were either combined into larger categories or eliminated from further analyses. Thus social attend, social glances, avert games (i.e., the caregiver covers her face while playing a game), and avert game glances were combined into a larger category labeled Social Attend. Caregiving and repositioning of the infant were combined to form a general category of Caregiving. The mother calling the infant's name, vocally directing the infant's attention to herself, or using vocal mouth noises were combined into a category labeled Vocal Elicits. The codes of object and infant body elicit (i.e., mothers pointing to an object or to parts of the infant's body), use objects, make noises other than vocal noises, and blow on infant were combined to form a larger category of Other Elicits. And, kissing the infant and sucking on part of the

infant's body were combined into a category called Oral Affective Displays.

A number of facial displays and behaviors were eliminated from further analyses. These codes were excluded either 1) because they could not be easily fitted together into larger coherent categories, 2) because after having been combined into larger categories these categories did not occur 3% or more of the time, or 3) because they had not been reliably coded. Thus the codes of nose-to-nose proximity, lean back, and rock infant were excluded because they could not be easily put into larger categories. The codes of poke, pull, and pinch infant were combined into a category labeled Intrusive Behavior but were eliminated because the category itself occurred less than 3% of the time. For the same reason, low, moderate, and high negative affective expressions were combined and excluded. Finally, the codes of general comforting and comforting/emphatic vocal utterances were eliminated because they were unreliably coded. Table 23 presents a list and description of all the individual affective and behavioral codes and larger categories included in the analyses. Tables 24 and 25 present the proportions of time and standard deviations mothers displayed these facial expressions and behavioral codes/categories across episodes and per episode.

Table 23

List and Description of All Maternal Affective and Behavioral Codes Included in Data Analyses

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Individual Codes:

High Positive Affect: The mother expresses marked positive affect such as laughter, giggling, broad smiles, and highly animated and exaggerated play faces.

Moderate Positive Affect: The mother's affect is less intense and animated than above. Examples are low intensity smiles, play and coo faces.

Low Positive Affect: The mother's facial expressions are bright, attentive, and interested but there are no smiles, play or coo faces.

Neutral Affect: The mother's facial expressions are bland and there is no animation of facial features.

Looming Proximity: The mother brings her face close to the infant's but there is no physical contact.

Average Proximity: The mother maintains an average interactive distance from the infant. She is not nose-to-nose with the infant, looming, or leaning back in her chair.

Object Attend: The mother looks at the same object the infant is looking at for 1 second or more.

Object Glances: The mother looks at the same object the infant is looking at for less than 1 second.

Avert: The mother looks away for 1 second or longer. She does not look at the infant or at an object the infant is looking at.

Avert Glances: The mother looks away for less than 1 second.

Note: Refer to the Maternal Regulatory Scoring System (MRSS) in Appendix C and the Maternal Hedonic Tone Scale in Appendix D for further details on affective and behavioral codes.

Continued, next page

Table 23 (Continued)

Individual Codes (Continued):

Vocalization: The mother talks to the infant. Words, baby talk, whispers, songs, laugther, and grunts are all scored as vocalizations.

Hold/Contain: The mother uses her hands to hold the infant. Examples include holding both shoulders, hands, feet, or legs.

Stroke/Touch: The mother touches or strokes the infant.

Tickle: The mother tickles the infant.

Rhythmic Movement of Limbs: The mother moves the infant's limbs (i.e., the infant's arms or legs) in a rhythmic manner. There must be at least two repetitive movements.

Reposition Self: The mother puts her face in the infant's line of vision typically by leaning to the side the infant is facing.

Combinations of Codes:

Social Attend: The mother looks or glances at the infant. The mother covers her face while playing a game (e.g., she covers her face in "Peek-A-Boo" games or tosses her head back in "I'm gonna get you" games).

The category was formed by combining the codes of social attend, social glances, avert game, and avert game glances.

Caregiving: The mother carries out some caretaking task. She wipes the infant's nose, adjusts the infant's strap, or readjusts the infant's posture or position in the infant seat.

The category was formed by combining the codes of caregiving and reposition infant.

Note: Refer to the Maternal regulatory Scoring System (MRSS) in Appendix C for further details on behavioral codes.

Continued, next page

Vocal Elicits: The mother attempts to draw the infant's attention to herself by calling the infant's name, vocally directing the infant's attention ("Hey! Look at me"!), or by making mouth noises (e.g., smacking her lips, clicking her tongue, raspberries).

The category was formed by combining the codes of calls name, directs to self, and mouth noises.

Other Elicits: The mother directs the infant's attention to an object (object elicit and use object) or to part of the infant's body or clothing (infant body elicit). The mother elicits the infant's attention by making noises using her hands or fingers (e.g., by snapping her fingers or clapping her hands) or by blowing on the infant.

The category was formed by combining the codes of object elicit, use object, infant body elicit, make noise, and blow.

Oral Affective Displays: The mother kisses the infant or sucks on the infant's body (e.g., the infant's toes or fingers).

The category was formed by combining the codes of kiss and suck on infant.

Note: Refer to the Maternal Regulatory Scoring System (MRSS) for further details on behavioral codes.

Table 24

Mean Proportions of Time (MP) and Standard Deviations (SD) Mothers of Male (M) and Female (F) Infants Displayed Affective Facial Expressions across Episodes, and during Play 1 and the Reunion Play (Visit 1)

Facial Expressions		Across Episodes		Play 1		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Neutral	M	.05	.05	.04	.07	.04	.05
	F	.06	.10	.06	.10	.06	.10
Low Positive	M	.18	.18	.16	.17	.18	.18
	F	.21	.15	.25	.19	.21	.15
Moderate Positive	M	.37	.17	.39	.17	.37	.17
	F	.34	.13	.37	.18	.34	.13
High Positive	M	.35	.23	.38	.22	.35	.23
	F	.36	.21	.29	.22	.36	.21

M = Mothers of male infants

F = Mothers of female infants

Table 25

Mean Proportions of Time (MP) and Standard Deviations (SD) Mothers of Male (M) and Female (F) Infants Displayed the MRSS-Coded Behaviors across Episodes, and during Play 1 and the Reunion Play (Visit 1)

MRSS-Coded Behaviors		Across Episodes		Play 1		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Social Attend	M	.93	.06	.93	.09	.93	.06
	F	.92	.07	.88	.07	.92	.07
Object Attend	M	.04	.05	.06	.11	.04	.05
	F	.07	.08	.10	.11	.07	.08
Object Glances	M	.04	.07	.05	.05	.04	.07
	F	.04	.05	.07	.05	.04	.05
Avert	M	.04	.04	.02	.03	.04	.04
	F	.03	.04	.03	.03	.03	.04
Avert Glances	M	.05	.06	.05	.04	.05	.06
	F	.04	.03	.05	.03	.04	.03

M = Mothers of male infants

F = Mothers of female infants

Continued, next page

Table 25 (Continued)

MRSS-Coded Behaviors		Across Episodes		Play 1		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Looming Proximity	M	.34	.27	.28	.24	.34	.27
	F	.36	.28	.28	.28	.36	.28
Average Proximity	M	.62	.28	.69	.27	.62	.28
	F	.63	.30	.69	.31	.63	.30
Vocal Elicit	M	.04	.06	.06	.10	.04	.06
	F	.02	.03	.04	.06	.02	.03
Other Elicit	M	.05	.17	.01	.04	.05	.17
	F	.05	.14	.03	.06	.05	.14

M = Mothers of male infants

F = Mothers of female infants

Table 25 (Continued)

MRSS-Coded Behaviors		Across Episodes		Play 1		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Vocalizations	M	.72	.17	.70	.16	.72	.18
	F	.68	.17	.69	.18	.68	.17
Mouth Noises	M	.07	.07	.07	.10	.07	.07
	F	.08	.09	.07	.10	.08	.09
Oral Affective Displays	M	.06	.15	.04	.07	.06	.15
	F	.04	.08	.03	.08	.04	.08
Caretaking	M	.02	.03	.03	.03	.02	.03
	F	.02	.04	.03	.05	.02	.04
Hold Infant	M	.17	.15	.13	.14	.17	.15
	F	.17	.17	.15	.14	.17	.17

M = Mothers of male infants

F = Mothers of female infants

Table 25 (Continued)

MRSS-Coded Behaviors		Across Episodes		Play 1		Reunion Play	
	SEX	MP	SD	MP	SD	MP	SD
Stroke Infant	M	.30	.17	.30	.19	.30	.17
	F	.36	.23	.37	.21	.36	.23
Tickle Infant	M	.08	.10	.06	.07	.08	.10
	F	.05	.10	.04	.06	.05	.10
Rhythmic Movement of Limbs	M	.18	.15	.18	.19	.18	.15
	F	.15	.13	.16	.14	.15	.13
Wave	M	.02	.05	.02	.06	.02	.05
	F	.08	.16	.03	.07	.08	.16
Reposition Self	M	.04	.08	.09	.14	.04	.08
	F	.03	.05	.06	.08	.03	.05

M = Mothers of male infants

F = Mothers of female infants

A 2(sex) x 2(episode) repeated measures ANOVA using MANOVA test criteria to control for the number of dependent variable tests was used to assess whether mothers interacted differently with their sons and daughters. Since all mothers were instructed to act the same way during the still-face episode this episode was not coded and not included in the ANOVA. Thus the ANOVA on the mothers' data set included only Play 1 and the Reunion Play as repeated measures. The repeated measures ANOVA was carried out on both the frequency and duration of each facial expression and behavior or behavioral category. For the frequency data, the ANOVA used each mother's proportion means as the unit of analysis. For the duration data, the average length of each mother's facial and behavioral displays was employed. The Huynh-Feldt Epsilon Statistic was used to determine the significance level of all F values.

As can be seen in Tables 26, 27, and 28 very few significant main or interaction effects in the frequency or duration of maternal affective and behavioral displays were found. There were small but significant main effects of gender for the frequency and duration of social attend, and the frequency of object attend, and wave (See Table 26). Mothers looked more frequently and longer at their sons

Table 26

Significant Main Effects of Gender

Behavior	MALE (N=38) MP	SD	FEMALE (N=43) MP	SD	Overall F for Gender
Frequency Data					
Social Attend	.93	.06	.92	.07	4.90*
Object Attend	.04	.05	.07	.08	4.55*
Wave	.02	.05	.08	.16	4.19*
Duration Data					
Social Attend	36.67	35.15	29.75	28.04	6.89**

* $p<.05$

** $p<.01$

Table 27

Significant Main Effects of Episode

Behavior	PLAY 1 MP	PLAY 1 SD	REUNION PLAY MP	REUNION PLAY SD	Overall F for Episode
Reposition Self	.07	.11	.04	.07	4.55*

* $p<.05$

Table 28

Significant Gender*Episode Interactions

Facial Expression & Behavior	MALE (N=38) MP	SD	FEMALE (N=43) MP	SD	Overall F for G*E Interaction
High Positive Affect					
Play 1	.38a	.22	.29a	.22	5.57*
Reunion	.35ab	.23	.36b	.21	
Object Glances					
Play 1	.05a	.05	.07b	.05	4.25*
Reunion	.04a	.07	.04a	.05	

* $p<.05$

Note: Proportion means with differing letters are significantly different from each other at $p<.05$

than at their daughters. Mothers also looked at objects their daughters were looking at and waved to them more often than they shared attention to objects with boys or waved to them. These data are not surprising in light of the infants' data. Male infants are more focused on the mother than female infants. Much of the males' behavior appear aimed at maintaining positive interactions with the mother whereas female infants spend significantly more time than males focused on objects. Thus the mothers appeared sensitive to these different interactive styles. They responded to their sons' social ouvertures by looking at them. Similarly, they were sensitive to their daughters' goal to look at objects as indicated by their willingness to share their daughters' focus of attention, and only occasional attempts to draw the infants' attention to themselves by waving to them.

There was only one main effect of episode (See Table 27). This suggests that mothers tend to act in the same way with their infants during both the first play and the reunion episodes. Only the frequency of mothers repositioning themselves or putting themselves in the infant's line of vision was different with mothers engaging in this behavior significantly more often during the first play. Similarly, there were only two gender*episode interactions for the codes of object glances and high positive affect (See Table 28). During play 1 mothers

glanced at objects girls were looking at more than they glanced at objects boys were looking at and they did so more during the reunion play than during the first play. Mothers also expressed more high positive affect to girls during the reunion play than during play 1.

Thus there was only a little data to support the hypothesis that mothers would act differently with their sons and daughters. Mothers looked at their sons more often and for longer periods of time, and looked and glanced at objects their daughters were looking at more frequently. Mothers also tried to elicit their daughters' attention by waving to them. These data are not surprising given that boys are more focused on the mother and girls are more focused on objects. Thus the mothers were sensitive to the infants' differing needs and only occasionally tried to elicit their daughters' attention.

There was no evidence at all to support the hypothesis that mothers would use different strategies to help males and females maintain internal and external regulation. Mothers of boys were no more likely than mothers of girls to engage in proximal non-arousing behaviors in order to keep infants contented. Similarly, mothers of girls were no more likely than mothers of boys to provide distal stimulation.

Of particular interest was the lack of change in the mothers' affective and behavioral displays during play 1

and the reunion play episodes. Given the infant data this is extremely surprising. Both boys and girls were significantly more distressed during the reunion play episode than during the first play and the expectation was that these differences would be reflected in the mothers' affect and behavior. Only the frequency of mothers putting themselves in the infants' line of vision and displays of high positive affect were different for the two episodes. Specifically, mothers were less likely to intrude on the infant during the second visit by leaning to the side the infant was leaning, and were more likely to display high positive affect to girls during the reunion play episode.

CHAPTER 4

GENERAL DISCUSSION

This study demonstrates gender based differences in infant interactive and regulatory capacity and in the stability of individual affective and behavioral displays. Although much of the data have already been discussed, several overall points can be made. First, the results indicate that boys are more emotionally reactive than girls. During the first administration of the Still-Face Paradigm, boys were significantly angrier and fussier than girls. They cried, wanted to be picked up, and attempted to distance themselves or escape from difficult situations significantly more often than girls. By contrast, girls appeared calmer and less emotionally reactive than boys. They fussed and cried less frequently, and expressed less anger and distancing.

The finding that boys are emotionally more reactive than girls is consistent with previous research demonstrating that boys are more irritable, cry and fuss more, and have greater difficulty maintaining affective regulation than girls during both the newborn and later infancy periods (Feldman et al., 1980; Korner, 1969; Moss, 1967; Osofsky & O'Connell, 1977; Phillips et al., 1978). Only three studies do not fit this description. Cohn and Tronick (1987) found no sex differences at ages 3, 6, and 9

months, Marcus and her colleagues (Marcus et al., 1985) found no differences in the frequency of negative mood in infants ranging in age from 6 to 24 months, and Malatesta and Haviland (1982) found no evidence that 3- and 6-month-old males cry more or are more irritable than females. Cohn, however, used very small samples at each age, Marcus relied on maternal perceptions of infant mood, and Malatesta terminated sessions after 10 seconds of fret crying and may therefore not have gotten a good baseline of the frequency of negative displays for boys and girls.

The second point to be made is that boys appear to be more responsive to social stimuli than girls. This interpretation is based on the findings that in both visits boys were significantly more likely than girls to express joy and to signal the mother with neutral/positive vocalizations and gestures, whereas girls were more likely than boys to focus on objects and to display facial expressions of interest. This finding is inconsistent with previous research which overwhelmingly suggests that girls are more responsive to social stimuli than boys in both the newborn and later infancy periods (Goldberg & Lewis, 1969; Gunnar & Donahue, 1980; Hittelman & Dickes, 1979; Klein & Durfee, 1978; Osofsky & O'Connell, 1977), but is consistent with research showing that girls are more likely than boys to display facial expressions of interest (Malatesta & Haviland, 1982). Although there were real

group differences in social responsiveness favoring the boys, it is nevertheless important not to overcharacterize these findings. Girls expressed facial expressions of joy and signaled the mother with vocalizations and gestures for a substantial amount of the time. Thus although the girls were more focused on objects, they were not socially disconnected from the mother or socially unresponsive.

The third point is that girls show greater regulatory capacities than boys. In both visits, girls were more likely than boys to divert their attention away from the mother to objects. In addition, when the data for visits 1 and 2 were combined, they were more likely than boys to use self-comforting strategies such as sucking an a thumb or on objects. Although there is not much research on this issue, the data are consistent with what previous research is available. Thus, Feldman and his colleagues (1980) and Korner (1974) have found that female newborns are significantly more likely to thumbsuck than male newborns.

Based on these data it is possible to draw two general conclusions. First, boys and girls have different interactive styles. The data available from the different analyses converge to support this conclusion. Thus, as a group, boys' interactive style is characterized by behaviors directed towards maintaining a positive social interaction with the mother (e.g., facial expressions of joy, neutral/positive vocalizations, gestures) and by

negative displays (e.g., anger, distancing, fussiness, crying, pick-me-up gestures) used to clearly communicate to the mother to change her behavior. The correlational data further suggest that these affective and behavioral displays are stable over time and emphasize the extent to which these displays represent characteristic and structured interactive strategies for the boys. By contrast, as a group, girls are more likely to look at objects and to display interest, and less likely to use behaviors that clearly and actively communicate to the mother that something is wrong and in need of rectification. The correlational data further suggest that, for girls, facial expressions of sadness and monitoring and evaluative strategies are stable and well-organized over time. Although sadness serves to communicate that something is wrong it has been described in the literature as a somewhat low key strategy to achieve change (Campos et al., 1983; Weinberg & Tronick, 1991a).

Secondly, it is possible, if not to conclude then at least to speculate, that boys and girls have different interactive styles <u>because</u> they have different regulatory capacities. Tronick (1989), working within the perspective of the Mutual Regulation Model, has suggested that infants have limited regulatory capacities and need a caregiver's help to maintain social, object, and self regulation. He further suggests that infants communicate to the caregiver

that they need additional help through their affective and behavioral displays. Positive affect and behavior communicate that everything is going well. Negative displays communicate that something is wrong and convey such messages as "change what you are doing" or "help me cope with this stress". By extending Tronick's argument it is possible to suggest that interactive and regulatory styles are inextricably linked and that infants' interactive styles reflect their regulatory capacities. Thus in this paper, the girls' greater regulatory capacities may reflect their greater ability to cope with stress on their own and therefore their lesser need to make needs known to the mother. Similarly, the boys' less frequent and effective regulatory capacities suggest that they must rely more than girls on dyadic regulation and therefore must make their needs more clearly known to the caregiver than girls. To the extent that regulatory behaviors are crucial to affective and social regulation, then it is possible that females' greater ability to self-regulate are at the base of some of the male/female differences found in emotional expressivity and social responsiveness.

Another finding important to consider is that although the infants' reactions to the episodes of the Still-Face Paradigm were similar, there were sex differences across episodes. The gender differences found across episodes are

inconsistent with previous findings. Cohn and Tronick (1987, 1989) found no sex differences in infant response to the still-face (Cohn & Tronick, 1987, 1989). Mayes and Carter (1990) and Field and Stoller (1982) found the opposite results. Field found that girls react to the still-face episode with more negative affect than boys, and Mayes found that girls become more disorganized, inconsolable, and physiologically dysregulated than boys. Differences in methodology and ages tested may account for these disparate findings. Cohn used very small samples and global scoring systems. Mayes and Field tested infants 3 months or younger. Previous research indicates that face-to-face interactions are not entirely consolidated until around 5 months of age. (Tronick, Cohn, & Shea, 1986).

The finding that gender differences were consistently found across episodes also indicates that stress does not highlight sex differences in the infants' affective and behavioral displays. This finding argues against the assumption made in the introduction that the still-face and reunion play episodes would be particularly useful tools to uncover sex differences in the organization of infant coping strategies because they challenge the infants' ability to maintain internal and external regulation. Considerably less stability in affective and behavioral responses was also found during the stressful still-face and reunion episodes than during the first play. These

findings argue against Sroufe's and Water's (1977) perspective that stress brings out more stable individual differences. The data suggest that infants are more likely to react in usual, characteristic, and stable ways when they are evaluated in situations that are representative of the expectable manner in which mothers and infants interact and that stable affective and behavioral responses collapse when the stress is significant.

Nonetheless the data support the idea that the still-face and particularly the reunion play episode are stressful. During the still-face episode, both boys and girls reacted with less joy, and increases in negative displays. During the reunion play episode, they reacted with a rebound of positive person oriented behaviors but at the same time continued to display high levels of negative affective and behavioral displays. The experience of conflicting emotions, the infants' need to reengage the mother, and to cope with the carryover effects from the still-face episode suggest that the reunion play episode may be a particularly stressful and arousing experience for the infants.

Interestingly, the second visit appeared to be less stressful particularly for the boys. Boys were significantly less likely to be angry, to cry, to want to be picked up, or to attempt to distance themselves or escape during the second visit than the first visit. These

differences were not found for the girls who showed negative affective and behavioral displays equally often in both visits. One explanation for these findings is that the boys may have remembered their experiences during the first visit and that the anticipation of stress during the second visit may have decreased the males' negative reactions. On the face of it, this explanation seems unlikely since there is no obvious reason why boys would remember the Still-Face Paradigm better than girls. There is little evidence for such male/female differences in information processing, memorial, or cognitive functioning at this age. It is possible, however, that visit 1 had a more powerful affective impact on the boys than on the girls, and that the recollection of this allowed for more effective affective regulation during visit 2. An alternative to this speculation is that the mothers of boys may have acted differently, less anxiously, during visit 2 than visit 1. This interpretation suffers from the notion that if boys were more upset during the first visit, the mothers too would be expected to be more anxious during visit 1 than visit 2. Further research is necessary before the finding that boys' lesser negative affect during the second visit can be more fully understood.

Although the second visit appeared less stressful than the first visit suggesting that the infants (at least the boys) may have remembered their experiences during the

first visit, the infants still reacted negatively to the still-face and reunion play episodes. Furthermore, there was no decrease of interest expressions during the second visit suggesting that this visit was still novel and interesting to the infants. This suggests that the still-face and reunion play episodes were still stressful and interesting to the infants even though they may have remembered their first visit to the laboratory. It also suggests that simple learning or habituation models, which would predict that the infants would be less stressed and interested during the second visit, are not likely explanations of the results.

Very few sex differences in the mothers' affective and behavioral displays were found. Mothers looked at their sons more often and for longer periods of time, and looked and glanced at objects their daughters were looking at more frequently. Mothers also tried to elicit their daughters' attention by waving at them. These data are not surprising given that boys are more focused on the mother and girls more focused on objects, and suggest that overall the mothers were sensitive and respectful of their infants differing needs.

Mothers, however, were much less reactive to infant sex differences than expected. For instance, there was no evidence that mothers used different strategies to help male and female infants maintain internal and external

regulation. This is surprising given the finding in this study that males appear less able to regulate affect and behavior on their own and require more regulatory support than females. It is also surprising given the literature which suggests that mothers use distal stimulation with their daughters and proximal stimulation with their sons (Lewis, 1972; Moss, 1967) possibly because, as has been suggested by Malatesta (Malatesta & Haviland, 1982), males are more irritable and physiologically vulnerable than girls. Similarly, there was little evidence that mothers changed their affect and behavior during the play 1 and reunion play episodes. Both boys and girls were significantly more distressed during the reunion play episode than during the first play and the expectation was that these differences would be reflected in the mothers' affect and behavior. This was not the case suggesting that the mothers were either relatively insensitive to these changes in infant affect and behavior or that they tended to provide a constant amount of stimulation and regulatory support to both boys and girls in different contexts. Further research, using more in depth statistical analyses, such as contingency or sequential analyses, are needed to explore this possibility and others regarding maternal responsiveness to infant displays.

The lack of maternal findings suggest that the emotional, interactive, and regulatory differences found in

the infants are not due to the mothers' behavior or affect or to the dyadic quality of the interaction. This is supported by the finding of consistent gender effects across episodes including the still-face episode during which all mothers' acted in the same way. These results argue against models such as Choderow's (1978) in which infant differences are typically attributed to the mothers' behavior. However, it remains unclear whether the observed differences in emotional expressivity, interactive styles, and regulatory capacity can be attributed solely to organismic differences in the infant. Although some of the data suggest that females may be more developmentally advanced than males in their ability to incorporate physiological, self, object, and social regulation and in their ability to regulate with less maternal support, the mothers and infants have nevertheless shared a 6 month interactive history during which much socialization must have gone on. A socialization perspective, however, although it may explain some of the infant sex differences, does not explain the lack of sex differences in the mothers' behavior. Further research starting at an earlier age and using a longterm longitudinal design is necessary to clarify this nature versus nurture issue.

Few studies have found gender differences and stability in affective and behavioral displays in infants as young as 6 months (Maccoby & Jacklin, 1974; Tronick &

Weinberg, 1990). This may be attributable to the usefulness of the Still-Face Paradigm as a tool for uncovering differences, to the large sample size, and/or to the extrememly detailed coding systems employed in the present study. The detailed scoring systems in particular may have played a crucial role since studies which used the Still-Face Paradigm and global/categorical scoring systems failed to reveal sex differences (Cohn & Tronick, 1987, 1989). This further suggests that it might be useful to use detailed scoring systems in situations other than the Still-Face Paradigm such as the Ainsworth Strange Situation where traditionally no sex differences have been found (Ainsworth, Blehar, Waters, & Wall, 1978).

Finally, the results indicate that it is important to consider sex differences when evaluating socio-emotional functioning during infancy. Many theories of socio-emotional development, including the Mutual Regulation Model, have not incorporated sex differences as a critical dimension. These data suggest that it is time to do so.

APPENDIX A

THE INFANT REGULATORY SCORING SYSTEM (IRSS)

INFANT REGULATORY SCORING SYSTEM/IRSS

Edward Z. Tronick
M. Katherine Weinberg

GAZE:	L1.	SOCIAL ENGAGEMENT
	L2.	OBJECT ENGAGEMENT
	L3.	SCANS
VOCAL SIGNALS:	V1.	NEUTRAL/POSITIVE
	V3.	FUSSY
	V4.	CRYING
GESTURAL SIGNALS:	G1.	PICK-ME-UP GESTURE
	G2.	OTHER GESTURE
SELF-COMFORT:	C1.	ORAL-SELF
	C2.	ORAL-OBJECTS
	C3.	SELF-CLASP
	C4.	ROCK
DISTANCE:	D1.	GET AWAY
	D2.	SCREEN OUT
	D3.	PUSH AWAY
INHIBITION:	I1.	PERCEPTUAL INHIBITION
	I2.	MOTOR INHIBITION
AROUSAL INDICATORS:	T1.	SPIT UP
	T2.	HICCUP
	T3.	HEAVY BREATHING
	T4.	TONGUEING
	T5.	YAWNING
UNSCORABLE:	US	
OTHER:	OT	

INFANT REGULATORY SCORING SYSTEM/IRSS

Edward Z. Tronick
M. Katherine Weinberg

GAZE: Each of the codes for the direction of the infant's gaze are mutually exclusive. This means that these codes cannot be scored in the same one second interval. Each of the gaze codes can be of any duration. The rule is: if you can see it in real time - code it. If you cannot distinctly tell what the baby is looking at, and are trying to choose between two codes, certain codes superordinate other codes. (This is the only situation in which the superordinate rule applies. Under all other circumstances use the time rules.) These codes are as follows: L1. SOCIAL ENGAGEMENT, superordinates L2. OBJECT ENGAGEMENT. L2. OBJECT ENGAGEMENT, superordinates L3. SCANS.

L1. SOCIAL ENGAGEMENT: The infant looks at the adult's face (e.g., her chin or forehead). NOTE: When the mother is playing a PEEK-A-BOO game with the infant, continue to code an L1 when the mother covers her face with her hands if the infant continues to look at the mother's face during this time.

L2. OBJECT ENGAGEMENT: The infant looks at or manipulates an object which is proximal or nearby to the infant for 2 seconds or more. In the face-to-face paradigm mothers are instructed not to bring toys into the laboratory. OBJECT ENGAGEMENT therefore refer to such objects as the chair, the infant strap, or the infant's clothing.

L3. SCANS: The infant looks away from the adult's face and does not look at an object. This code includes instances when the infant visually explores the room or looks from object to object without focusing on anything for 2 secons or more.

VOCAL SIGNAL: The infant vocalizes.

V1. NEUTRAL/POSITIVE: The vocalization is neutral to positive. This code includes laughter, gurgles, coos, and neutral sounds.
V2. FUSSY: The vocalization is fussy.
V3. CRYING: The infant is crying. Must be a fullblown cry to be scored.

GESTURAL SIGNALS: The infant gestures with his/her arms or body. The gesture is clearly directed toward the adult. Do not score vague and unfocused movements. Most of the time the infant will be looking at the adult while gesturing. Occasionally, however, there may be some instances when the infant does not look at the adult but the gesture is nevertheless clearly adult directed.

G1. PICK-ME-UP GESTURE: The infant extends both arms toward the adult with the "intention" to be picked up.

G2. OTHER GESTURES: The infant extends one arm, points or reaches toward the adult, touches the adults, leans forward, kicks or bangs his/her arms or legs.

SELF-COMFORT: The infant uses his/her body to provide self- stimulation. Self-comforting must be initiated by the infant. For example, if the mother brings the infant's hand to the infant's mouth and the baby sucks on the hand do not score C1. If the mother removes her hold and the baby continues to suck, then C1 can be scored.

C1. ORAL-SELF: The infant sucks on his/her body, e.g., his/her thumb. There must be skin contact.

C2. ORAL-OTHER: The infant sucks on something other than his/her body such as the strap of the chair or his/her clothing.

C3. SELF-CLASP: The infant clasps his/her hands together or wraps his/her arms around himself/herself as in a self-hug.

C4. ROCK: The infant rocks back and forth or side to side.

DISTANCE: The infant attempts to increase his/her perceptual or physical distance from the mother without engaging an object.

D1. GET AWAY: The infant tries to get away by turning,twisting, and or arching his/her body. The infant's head is averted up and sideways and the arms are raised above or at the level of his/her head. The back is often, but not always arched. Do not score infants who have this constellation of behaviors but are trying to get a better look at an object.

D2. SCREEN OUT: While attending to the mother, the infant screens both eyes with his/her hands.

D3. PUSH AWAY: The infant attempts to push the mother away from him/her. The infant pushes the mother's hand(s) or head away from himself/herself.

INHIBITION: I. The infant inhibits his/her perceptual, attentional, or motor processes to minimize engagement with the mother and the surround.

I1. PERCEPTUAL INHIBITION: The infant inhibits his/her perceptual processes as evidenced in looking "dull", vacant, "glassy-eyed", or by falling asleep.

I2. MOTOR INHIBITION: The infant gives up postural control and thus fails to support him/herself.

AROUSAL INDICATORS: T1. The infant exhibits behaviors which may indicate arousal/distress such as spitting up, hiccupping, heavy breathing, tongueing (e.g., tongue protrudes out of mouth), and/or yawning.

UNSCORABLE. US. The infant's face or body are obscured. Vocalizations cannot be scored because of poor quality of sound. US can be scored in any behavioral category.

OTHER. OT. The infant's behavior does not fit any of the above codes. Always describe fully the reasons for using this code.

TIME RULES:

Scoring is done on a second by second basis. All behaviors except for vocalizations are rounded off.

The following time rules apply to all behaviors except vocalizations which are scored in the second they occur without rounding off.

Behaviors are rounded off at the level of a 100th of a second. For example, if a gaze behavior begins at 1:40:27, enter the code in the 1 min. 40 sec. interval. If a behavior begins at 1:40:50 or at 1:40:89, enter the code in the 1:41 interval.

Gaze behaviors are mutually exclusive and are coded continuously. The infant is always looking at something or his/her eyes are closed. Since GAZE behaviors are mutually exclusive only the onset of each gaze behavior is considered. This is because the onset of each new gaze behavior corresponds to the end of the previous gaze behavior.

Always round off the **BEGINNING** of each **NEW** behavior

Examples of how the rounding off rule works.

```
L1   4:02:42  (round off to 4:02)
L2   4:03:50  (round off to 4:04)
L2   4:04:78  (round off to 4:05)
L3   4:06:00  (round off to 4:06)
```

Min	sec	GAZE
4	2	L1
	3	L1
	4	L2
	5	L2
	6	L3

On occasion more than one behavior will occur within a one second interval. In this case, code the last behavior that occurred within that one second interval. Remember that because of the rounding rule, intervals start at the half second point (ex, 6:50-7:50). Therefore, code the last behavior that occurred before the half second point. Below is an example illustrating this time rule.

Example of how to code more than one behavior in a second.

```
L3 4:02:61  (round off to 4:03)
L1 4:03:54  (round off to 4:04)
L2 4:04:14  (round off to 4:04)
L1 4:05:51  (round off to 4:06)
```

Min	sec	code
4	3	L3
	4	L1+L2
	5	L2
	6	L1

The L1 and L2 codes occurred in the same second (4:04) after the time of onset of both behaviors was rounded off. Because the L2 occurred last in the interval, it is coded and the L1 is dropped.
Thus:

Min	sec	code
4	3	L3
	4	L2
	5	L2
	6	L1

The other behaviors should be coded using the same time rules as for gaze. However, since these behaviors are not continuous both the beginning and the end of the codes need to be rounded off. Thus if a behavior begins at 1:40:27, enter the code in the 1:40 interval. If a behavior begins at 1:40:50 or at 1:40:89, enter the code in the 1:41 interval. Similarly, if a behavior ends at 1:40:27, code the behavior through the 1:40 interval. If a behavior ends at 1:40:50 or at 1:40:89, code the behavior through the 1:41 interval. This rule applies to all behaviors with the exceptions of Vocalizations which are coded in the second they occur.

GENERAL NOTE:

The IRSS was designed to score the behavior of infants younger than 1 year. The system has been used primarily to score the behavior of 3, 6, and 9-month-old infants. To score the behavior of infants 1 year or older, use the Infant Regulatory Scoring System for 12-month-olds originally designed to capture the behavior of infants in the Ainsworth Strange Situation paradigm. To capture the behavior of premature infants use the IRSS-premie version. To this date we have used this system successfully with 3-month-old (corrected age) premature infants.

APPENDIX B

A SYSTEM FOR IDENTIFYING AFFECT EXPRESSIONS BY HOLISTIC JUDGEMENTS (AFFEX)

EMOTIONS: The emotions displayed on the infant's face.

EJ Joy

SA Surprise

IE Interest

SD Sad

AR Anger

FT Fear

DR Disgust

DP Distress

CS Contempt

SH Shame/guilt/shyness

CODING QUALIFIERS

NC Noncodable: The infant is displaying an emotion which is not scored by the AFFEX system.

OB Obscure: The infant's face is not visible.

* Asterisk: Hiccups and sneezes, and emotional displays that last less than .5 seconds.

INTENSITY RATING: The intensity of the emotions displayed on the infant's face.

0. Low intensity: The infant displays low affective intesity.

1. Moderate intensity: The infant displays moderate affective intensity.

2. High intensity: The infant displays high affective intensity.

Verbal Descriptions of Appearance Changes by Region for the Facial Expressions of Interest, Joy, Sadness, and Anger.

Forehead/Eyebrows/ Nasal Root	Eye/Nose/Cheeks	Mouth/Lips/Chin
Interest		
1 brows raised, normal shape; bulging or thickening of forehead or long transverse furrows; nasal root narrowed	enlarged, widened roundish appearance of eye region (upper eye furrow may be visible); tissue between upper lip and brow stretched but upper eyelids not raised	mouth opened, relaxed
2 brows drawn together; and possibly slightly downward; bulge between brows or verticle furrows	eyes narrowed or squinted; lateral part of the brow may be lowered and cheeks raised	mouth opened, relaxed, tongue forward (beyond gum line), may be moving
3 forehead smooth; brows in resting position	eyes normally open	lips pursed
4	cheeks raised	mouth closed, relaxed
Joy		
1 forehead smooth	cheeks raised; furrow below eyes may be visible	corners of mouth drawn back and up

Forehead/Eyebrows/ Nasal Root	Eye/Nose/Cheeks	Mouth/Lips/Chin
Sadness		
1 inner coners of brow raised; triangular shape of skin under inner corners of brow	raised lower lid and cheeks	corners of mouth drawn downward, outward, mouth opened or closed
2 bulge or verticle wrinkles between inner corners of brow	eyes squinted	center of lower lip pushed upward by chin muscle
3 upper eyelid pulled up at corner		furrows from nose to mouth corners (nasolabial fold) lengthened
4 ii shape may be formed by verticle wrinkles between brows and short horizontal wrinkles across brows (not usually seen in infants and young children)		
Anger		
1 brows drawn sharply downward and together	eyes squinted	rectangular or squarish mouth
2 bulge or verticle wrinkles between	eyes narrowed by lowering of brow	wide open, tense mouth
3 nasal root broadened, bulged	cheeks raised	older children and adults may show mouth closed, lips pressed together tightly, teeth clenched

APPENDIX C

THE MATERNAL REGULATORY SCORING SYSTEM (MRSS)

MATERNAL REGULATORY SCORING SYSTEM/MRSS

Edward Z. Tronick
M. Katherine Weinberg

PX. PROXIMITY TO INFANT
- PX1. NOSE TO NOSE
- PX2. LOOM
- PX3. AVERAGE
- PX4. BACK

CG. CAREGIVING

SE. SOCIAL ENGAGEMENT
- SE1. SOCIAL ATTEND
- SE2. SOCIAL GLANCE
- SE3. AVERT GAME
- SE4. AVERT GAME GLANCE

OE. OBJECT ENGAGEMENT
- OE1. OBJECT ATTEND
- OE2. OBJECT GLANCE

A. AVERT
- A1. AVERT
- A2. AVERT GLANCE

C. COMFORT

E. ELICIT
- E1. OBJECT ELICIT
- E2. INFANT BODY ELICIT

V. VOCALIZE
- V1. VOCALIZATION
- V2. CALLS NAME
- V3. DIRECTS TO SELF
- V4. EMPHATIC/COMFORTING UTTERANCE
- V5. MOUTH NOISES

T. TOUCH
- T1. TOUCH/STROKE/TAP
- T2. HOLD/CONTAIN
- T3. REPOSITION INFANT
- T4. POKE/JAB
- T5. TICKLE
- T6. PULL
- T7. RHYTHMIC MOVEMENT OF LIMBS
- T8. ROCK
- T9. KISS

T10. PINCH
T11. SUCK ON INFANT

SP. OTHER SPECIFIC BEHAVIORS
SP1. USE OBJECT
SP2. MAKE NOISE
SP3. WAVE
SP4. REPOSITION SELF
SP5. BLOW

US. UNSCORABLE

OT. OTHER

MATERNAL REGULATORY SCORING SYSTEM/MRSS

Edward Z. Tronick
M. Katherine Weinberg

PX. PROXIMITY TO INFANT: How close the caregiver is to the infant.

- PX1. NOSE-TO-NOSE: The caregiver brings her face right up to the infant's face and there is physical contact, e.g., she kisses the infant.
- PX2. LOOM: The caregiver brings her face close to the infant's face but there is no physical contact.
- PX3. AVERAGE: The caregiver is neither nose-to-nose, looming, nor leaning back, i.e., she maintains a typical or average interactive distance.
- PX4. BACK: The caregiver leans back in her chair away from the infant.

CG. CAREGIVING: The caregiver carries out some caretaking activity, e.g., she wipes the infant's face or adjusts the infant's strap.

SE. SOCIAL ENGAGEMENT: The caregiver looks at the infant.

- SE1. SOCIAL ATTEND: The caregiver looks at the infant for 1 second or longer.
- SE2. SOCIAL GLANCE: The caregiver looks or glances at the infant for less than 1 second.
- SE3. AVERT GAME: The caregiver looks away from the infant for 1 second or longer while playing a game, e.g., she covers her eyes in "Peek-a-Boo" or tosses her head back in "I'm gonna get you."
- SE4. AVERT GAME GLANCE: The caregiver engages in an avert game that lasts for less than 1 second.

OE. OBJECT ENGAGEMENT: The caregiver looks at an object.

- OE1. OBJECT ATTEND: The caregiver looks at the same object the infant is looking at for 1 second or more. If the infant changes his/her attention from one object to another and the mother follows the infant's attention, score as one continuous bout of Object Attend.
- OE2. OBJECT GLANCE: The caregiver glances at an object which is being attended to by the infant for less than 1 second.

A. AVERT: The caregiver does not look at the infant or at objects attended to by the infant, e.g., the caregiver looks around the room or looks at an object that the infant is not looking at.

A1. AVERT: An Avert that lasts longer than 1 second.
A2. AVERT GLANCE: An Avert which lasts less than 1 second.

C. COMFORT: The caregiver attempts to comfort the infant by touching, holding, containing, or caressing the infant.

E. OBJECT ELICIT: The caregiver attempts to elicit the infant's attention to an object or to the infant's body.

E1. OBJECT ELICIT: The caregiver attempts to elicit the infant's attention to an object that is not the infant's body. E1 is scored in conjunction with Use Objects (SP1) below. Score only when the infant's attention is somewhere else. Stop scoring when the infant looks at the object.
E2. INFANT BODY ELICIT. The caregiver attempts to elicit the infant's attention to a part of the infant's body or clothing. Stop scoring when the infant looks.

V. VOCALIZE: The caregiver vocalizes to the infant.

V1. VOCALIZATION: The caregiver vocalizes to the infant. Score any distinguishable words, baby talk, whispers, laughter, growls, and grunts as Vocalizations. As a general rule, any forms of vocalization that are the result of movement of the vocal cords can be scored as a Vocalization.
V2. CALLS NAME: The caregiver calls the infant's name or nickname in order to get the infant's attention. Do not score V2 if the mother uses the infant's name in an ongoing dialogue or in songs.
V3. DIRECTS TO SELF: The caregiver attempts to direct the infant's attention to herself, e.g., "Look at me!", "Hey!", "Look over here!!".
V4. EMPHATIC/COMFORTING UTTERANCE: The caregiver makes an emphatic, comforting, or soothing utterance, e.g., "What's wrong?".

V5. MOUTH NOISES: The caregiver makes noises with her mouth, lips, or tongue, but not with her vocal cords, e.g., clicking sounds, kissing sounds, raspberries.

T. TOUCH: The caregiver touches the infant.

T1. TOUCH/STROKE/TAP: The caregiver touches, strokes, or lightly taps the infant without poking or tickling the infant. All codes that involve physical contact with the infant such as Hold and Contain, Pull, and POKE take precedence over Touch/Stroke/Tap. For example, if a T2 HOLD/CONTAIN is scored, do not score a T1.

T2. HOLD/CONTAIN: The caregiver uses her hands to hold and contain the infant without rhythmically moving the infant's limbs. Examples include holding both the infant's shoulders, arms, hands, legs, or feet. If the caregiver, for example, holds only one arm or foot score a T1.

T3. REPOSITION INFANT: The caregiver shifts the infant's position, e.g., by turning the infant's body or head. This code takes precedence over T2 HOLD AND CONTAIN.

T4. POKE/JAB: The caregiver pokes or jabs the infant.

T5. TICKLE: The caregiver tickles the infant.

T6. PULL: The caregiver takes the infant's hands and pulls the infant's body forward.

T7. RHYTHMIC MOVEMENT OF LIMBS: The caregiver moves the infant's limbs in a rhythmic movement, e.g., the infant's arms or feet. There must be at least two identical up and down or side to side movements for T7 to be scored.

T8. ROCK: The caregiver rocks the infant's entire body or the chair in which the infant is sitting.

T9. KISS: The caregiver kisses the infant's face or body.

T10. PINCH: The caregiver pinches the infant.

T11. SUCK ON INFANT: The caregiver sucks on the infant's face or body such as the infant's toes or hands.

SP. OTHER SPECIFIC BEHAVIORS: Other specific behaviors employed by the caregiver.

SP1. USE OBJECT: The caregiver uses an inanimate object in her activities with the infant. The caregiver need not look at the object. The infant's clothing is not an object, unless the clothing has been taken off the infant. For instance, if the mother waves the infant's shoe while the infant is wearing it, do not score

as SP1. If the mother waves the infant's shoe when the infant is not wearing it, score as SP1. This code is often coded in conjunction with E1 OBJECT ELICIT.

SP2. MAKE NOISE: The caregiver makes noises using her hands or fingers, e.g., by snapping her fingers, clapping her hands, scratching the infant seat, or tapping the table.

SP3. WAVE: The caregiver waves her hands or fingers in front of the infant.

SP4. REPOSITION SELF: The caregiver shifts her position in order to place herself in the infant's line of vision, e.g., by leaning to the side the infant is facing. Do not score simple head tilting as SP4.

SP5. BLOW: The caregiver blows on the infant.

US. UNSCORABLE: The coder cannot see enough of the mother to score a particular code because of the camera angle.

OT. OTHER: The caregiver's behavior does not fit any of the above codes. Always describe fully the reasons for using this code.

Note: Glances are put in a separate column from SA1, SA3, OA1, and A1. Glances do not interrupt the flow of these longer lasting behaviors.

Note: Scoring is done on a second-by-second basis. For the majority of the codes, follow this time rule. If a behavior begins at 1:40:27, enter the code in the 1:40 interval. If a behavior begins at 1:40:50 or at 1:40:89, enter the code in the 1:41 interval. Similarly, if a behavior ends at 1:40:27, code the behavior through the 1:40 interval. If a behavior ends at 1:40:50 or at 1:40:89, code the behavior through the 1:41 interval. This rule applies to all behaviors with the exceptions of Glances and Vocalizations which are coded in the second they occur.

Note: The MRSS was developed to code the behavior of caregivers in the face-to-face and still-face paradigms. The system was designed to be compatible with the Infant Regulatory Scoring System (IRSS) used to code the behavior of infants under 1 year of age.

APPENDIX D

THE MATERNAL HEDONIC TONE SCALE

MATERNAL HEDONIC TONE SCALE

ADULT POSITIVE

High Positive	7	The caregiver expresses marked positive affect, e.g., laughter, giggling, full smiles, or highly animated and exaggerated play faces.
Moderate Positive	6	The caregiver facially expresses moderate positive affect that is less intense and animated than in 7, e.g., smiles, play and coo faces.
Low Positive	5	The caregiver expresses brightness in face but there are no smiles and very little animation. Facial expressions of interest and attentiveness are examples.

ADULT NEUTRAL

Neutral	4	The caregiver expresses affect which is neither positive nor negative. Bland expressions with no animation of facial features is an example. The caregiver can be engaged or disengaged from the infant or taking a pause/break.

ADULT NEGATIVE

Low Negative	3	The caregiver's facial expressions are sober, worried, concerned, or serious.
Moderate Negative	2	The caregiver's facial expression is negative, e.g., clear and evident frowns or grimaces, or moderately negative play faces.
High Negative	1	The caregiver facially expresses marked negative affect such as sadness, disgust, fear, anger, or negatively exaggerated play faces.

SPECIAL CODES

Unscorable	US	The caregiver's face is not visible because of the angle of the camera or because the caregiver has covered her face with her hands. If the caregiver's affect is the same before and after the US, score as one continuous affect. If the affect is different before and after the US, score the US.
Uncodable	UC	The caregiver's affect does not fit into any of the above ratings.

Scoring is done second-by-second.

APPENDIX E

RELIABILITY TABLES

Table 29

Overall Reliability for the IRSS Codes

Behavior	Overall Reliability
Social Engagement	87%
Object Engagement	96%
Scans	92%
Neutral/Positive Vocs.	75%
Fussy Vocalizations	81%
Crying	77%
Pick-Me-Up Gestures	77%
Gestural Signals	77%
Oral Self-Comforting	100%
Other Self-Comforting	96%
Self-Clasp	92%
Rock	-
Get Away/Escape	91%
Screen Out	88%
Arousal Indicators	80%

Table 30

Overall Reliability for the AFFEX Codes

Facial Expression	Overall Reliability
Joy	89%
Interest	95%
Sadness	82%
Anger	89%

Table 31

Overall Reliability for the MRSS Codes

Behavior	Overall Reliability
Proximity to Infant	
Nose-To-Nose	76%
Loom	86%
Average	94%
Back	-
Caregiving	75%
Gaze	
Social Attend	98%
Social Glance	90%
Avert Game	96%
Object Attend	90%
Object Glance	83%
Avert	89%
Avert Glance	82%
Comfort	61%
Elicit	
Object Elicit	80%
Infant Body Elicit	67% (2/3)
Vocalize	
Vocalization	96%
Calls Name	79%
Directs to Self	75%
Emphatic/Comforting Voc	57%
Mouth noises	84%
Touch	
Touch/stroke/tap	93%
Hold/Contain	92%
Reposition Infant	86%
Poke/Jab	83%
Tickle	91%
Pull	80%
Rhythmic Movements	93%

Table 31 (Continued)

Behavior	Overall Reliability
Rock	-
Kiss	91%
Pinch	100%
Suck	97%
Other Specific Behaviors	
Use Object	100%
Make Noise	93%
Wave	87%
Reposition Self	85%
Blow	77%

Table 32

Overall Reliability for the Maternal Hedonic Tone Scale Codes

Facial Expression	Overall Reliability
High Positive	89%
Moderate Positive	82%
Low Positive	80%
Neutral	78%
Low Negative	61% (42/69)
Moderate Negative	-
High Negative	-

BIBLIOGRAPHY

Ainsworth, M.D.S., Blehar, M., Waters, E., & Wall, S. (1978). Patterns of Attachment: A Psychological Study of the Strange Situation. Hillsdale, NJ.: Erlbaum.

Beach, F. (1977). Human Sexuality in Four Perspectives. Baltimore: Johns Hopkins University Press.

Brazelton, T.B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L.A. Rosenblum (Eds.), The Effect of the Infant on its Caregiver. New York, N.Y.: Wiley.

Bowlby, J. (1980). Attachment and Loss. Attachment. Vol.1, 2nd edition. New York, NY.: Basic Books.

Campos, J.J., Barrett, K.C., Lamb, M.E., Goldsmith, H.H., & Stenberg, C. (1983). Socioemotional development. In M.M. Haith & J.J. Campos (Eds.), Handbook of Child Psychology: Vol.2. Infancy and Developmental Psychobiology (pp. 783- 915). New York, NY.: Wiley

Carter, A.S., Mayes, L.C., & Pajer, K.A. (1990). The role of dyadic affect in play and infant sex in predicting infant response to the still-face situation. Child Development, 61, 764-773.

Choderow, N. (1978). The Reproduction of Mothering. Berkeley, CA.: University of California Press.

Cohen, J. & Cohen, P. (1975). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Hillsdale, N.J.: Lawrence Erlbaum.

Cohn, J.F., Campbell, S.B., Matias, R., & Hopkins, J. (1990). Face-to-face interactions of postpartum depressed and non-depressed mother-infants pairs at 2 months. Developmental Psychology, 26(1), 15-23.

Cohn, J.F. & Tronick, E.Z. (1983). Three-month-old infants' reaction to simulated maternal depression. Child Development, 54, 185-193.

Cohn, J.F. & Tronick, E.Z. (1987). Mother-infant fae-to-face interaction: The sequence of dyadic states at 3, 6, and 9 months. Developmental Psychology, 23(1), 68-77.

Cohn, J.F. & Tronick, E.Z. (1989). Specificity of infants' response to mothers' affective behavior. Journal of the American Academy of Child and Adolescent Psychiatry, 28(2), 242-248.

Epstein, S. (1983). A research paradigm for the study of personality and emotions. In M.M. Page (Ed.), Personality: Current Theory and Research. Nebraska Symposium On Motivations (pp. 92-154). Lincoln: University of Nebraska Press.

Feldman, J.F., Brody, N., & Miller, S.A. (1980). Sex differences in non-elicited neonatal behaviors. Merrill- Palmer Quarterly, 26(1), 63-73.

Field, T.M. (1977). Effects of early separation, interactive deficits, and experimental manipulations on infant-mother face-to-face interactions. Child Development, 48, 763-771.

Field, T., Haely, B., Goldstein, S., & Guthertz, M. (1990). Behavior-state matching and synchrony in mother-infant interactions of nondepressed versus depressed dyads. Developmental Psychology, 26(1), 7-14.

Fogel, A., Diamond, G.R., Langhorst, B.H., & Demos, V. (1983). Affective and cognitive aspects of the 2-month-old's participation in face-to-face interaction with the mother. In E.Z. Tronick (Ed.), Social Interchange in Infancy: Affect, Cognition, and Communication (pp. 37-57). Baltimore: University Park Press.

Gianino, A.F. (1982). The ontogeny of coping responses in infancy. Unpublished manuscript, University of Massachusetts, Amherst.

Gianino, A.F. (1985). The stability of infant coping with interpersonal stress. Unpublished Doctoral Dissertation, University of Massachusetts, Amherst.

Gianino, A. & Tronick, E.Z. (1988). The mutual regulation model: The indant's self and interactive regulation, coping, and defense. In T. Field, P. McCabe, & N. Schneiderman (Eds.), Stress and Coping (pp. 47-68). Hillsdale, NJ.: Erlbaum.

Goldberg, S. & Lewis, M. (1969). Play behavior in the year-old infant: Early sex differences. Child Development, 40, 21-31.

Gunnar, M.R. & Donahue, M. (1980). Sex differences in social responsiveness between six months and twelve months. Child Development, 51, 262-265.

Haviland, J.J. & Malatesta, C.Z. (1981). The development of sex differences in nonverbal signals: Fallacies, facts, and fantasies. In C. Mayo & N. Henley (Eds.), Gender and Nonverbal Behavior. New York, NY.: Springer Verlag.

Hittelman, J.H. & Dickes, R. (1979). Sex differences in neonatal eye contact time. Merrill-Palmer Quarterly, 25(3), 171-184.

Izard, C.E. (1977). Human Emotions. New York, NY.: Plenum.

Izard, C.E. (1978). On the ontogenesis of emotions and emotion cognition relationships in infancy. I M.Lewis & L. Resenblum (Eds.), The Development of Affect. New York: Plenum.

Izard, C.E. & Dougherty, L.M. (1980). A system for identifying Affect Expressions by Holistic Judgements (AFFEX). Newark, Delaware: University of Delaware, Instructional Resources Center.

Klein, R. & Durfee, J. (1978). Effects of sex and birth order on infant social behavior. Infant Behavior and Development, 1, 106-117.

Korner, A.F. (1969) Neonatal startles, smiles, erections, and reflex sucks as related to state, sex, and individuality. Child Development, 40, 1039-1053.

Korner, A.F. (1974). The effct of the infant's state, level of arousal, sex, and ontogenetic stage on the caregiver. In M. Lewis & L.A. Rosenblum (Eds.), The Effect of the Infant on its Caregiver. New York, N.Y.: Wiley.

Lewis, M. (1972). State as an infant-environment interaction: An analysis of mother-infant interaction as a function of sex. Merrill-Palmer Quarterly, 18, 95-121.

Maccoby, E.E. & Jacklin, C.M. (1974). The Psychology of Sex Differences. Stanford, CA.: Stanford University Press.

Main, M. & Solomon, J. (1986). Discovery of an insecure-disorganized/disoriented attachment pattern. In T.B. Brazelton & M. Yogman (Eds.), Infancy: Affective Development. Norwood, N.J.: Ablex.

Malatesta, C.Z. (1982). The expression and regulation of emotion: A lifespan perspective. In T. Field & A. Fogel (Eds.), Emotion and Early Interaction. Hillsdale, NJ.: Lawrence Erlbaum.

Malatesta, C.Z. & Haviland, J.M. (1982). Learning display rules: The socialization of emotion expression in infancy. Child Development, 53, 991-1003.

Marcus, J., Maccoby, E.E., Jacklin, C.N., & Doering, C.H. (1985). Individual differences in early childhood: Their relation to gender and neonatal sex steroids. Developmental Psychobiology, 18, 327-340.

Mayes, L.C. & Carter, A.S. (1990). Emerging social regulatory capacities as seen in the still-face situation. Child Development, 61, 754-763.

Moss, H.A. (1967). Sex, age, and state as determinants of mother-infant interaction. Merrill-Palmer Quarterly, 13, 19-36.

Myers, N.A., Clifton, R.K., & Clarkson, M.G. (1987). When they were very young: Almost-threes remember two years ago. Infant Behavior and Development, 10, 123-132.

Osofsky, J.D. & O'Connell, E.J. (1977). Patterning of newborn behavior in an urban population. Child Development, 48, 532
536.

Phillips, S., King, S., & DuBois, L. (1978). Spontaneous activities of female versus male infants. Child Development, 49, 590-597.

Rubin, J.Z., Provenzano, F.J., & Luria, Z. (1974). The eye of the beholder: Parents' views on sex of newborns. American Journal of Othopsychiatry, 44(4), 512-519.

Sander, L.W. (1975). Infant and caretaking environment: Investigation and conceptualization of adaptive behavior in a system of increasing complexity. In E.J. Anthony (Ed.), Explorations in Child Psychiatry. New York: Plenum.

Sander, L.W. (1977). The regulation of exchange in the infant-caretaker system and some aspects of the context-content environment. In M. Lewis & L.A. Rosenblum (Eds.), Interaction Conversation and the Development of Language. New York: Wiley.

Sroufe, A. & Waters, E. (1977). Attachment as an organizational construct. Child Development, 48, 1184-1199.

Stern, D. (1977). The First Relationship. Mother and Infant. J. Bruner, M. Cole, & B. Lloyd (Eds.). Cambridge, MA: Harvard University Press.

Stoller, S.A. & Field, T. (1982). Alteration of mother and infant behavior and heart rate during a still-face perturbation of face-to-face interaction. In T. Field & A. Fogel (Eds.), Emotion and Early Interaction (pp. 57-82). Hillsdale, NJ.: Erlbaum.

Tomkins, S. (1963). Affect, Imagrey, Consciousness. Vol.2. The Negative Affects. New York, NY.: Springer.

Tronick, E.Z. (1989). Emotions and emotional communication in infants. American Psychologist, 44(2), 112-119.

Tronick, E.Z., Als, H., Adamson, L., Wise, S., & Brazelton, T.B. (1978). The infant's response to entrapment between contradictory messages in face-to-face interaction. Journal of the American Academy of Child Psychiatry, 17, 1-13.

Tronick, E.Z., Als, H., & Brazelton, T.B. (1980). Monadic phases: A structural descriptive analysis of infant-mother face-to-face interaction. Merrill-Palmer Quarterly, 26, 1-24.

Tronick, E.Z. & Cohn, J.F. (1989). Infant-mother face-to-face interaction: Age and gender differences in coordination and the occurrence of miscoordination. Child Development, 60(1), 85-92.

Tronick, E.Z., Cohn, J.F., & Shea, E. (1986). The transfer of affect between mothers and infants. In T.B. Brazelton & M.W. Yogman (Eds.), Affective Development in Infancy (pp. 11-25). Norwood, NJ.: Ablex.

Tronick, E.Z. & Gianino, A.F. (1986). Interactive mismatch and repair: Challenges to the coping infant. Zero to Three, Bulletin for the Center for Clinical Infant Programs, Vol. VI, No.3, 1-6.

Tronick, E.Z. & Weinberg, M.K. (1989). The Maternal Regulatory Scoring System (MRSS). Unpublished document, The Child Development Unit, Children's Hospital, Boston.

Tronick, E.Z. & Weinberg, M.K. (1990). Stability of coping and emotions in 6-month-olds. Paper presented at The International Conference on Infant Studies (ICIS), Montreal, Canada.

Weinberg, M.K. & Tronick, E.Z. (1991a). Organization and specificity in infant affective configurations. Paper submitted to Child Development.

Weinberg, M.K. & Tronick, E.Z. (1991b). Stability of infant social and coping behaviors and affective displays between 6 and 15 months: Age-appropriate tasks and stress bring out stability. Paper presented at the Society for Research in Child Development (SRCD), Seattle, Washington.

Weissbluth, M. & Liu, K. (1983). Sleep patterns, attention span, and infant temperament. Developmental and Behavioral Pediatrics, 4(1), 34-36.